OMPS Aerosol Index global climatology

Ghassan Taha

Co-authors
Peter Colarco, Valentina Aquila, Robert Loughman, Glen Jaross, P. K. Bhartia and the OMPS team

OMPS Science Team Meeting
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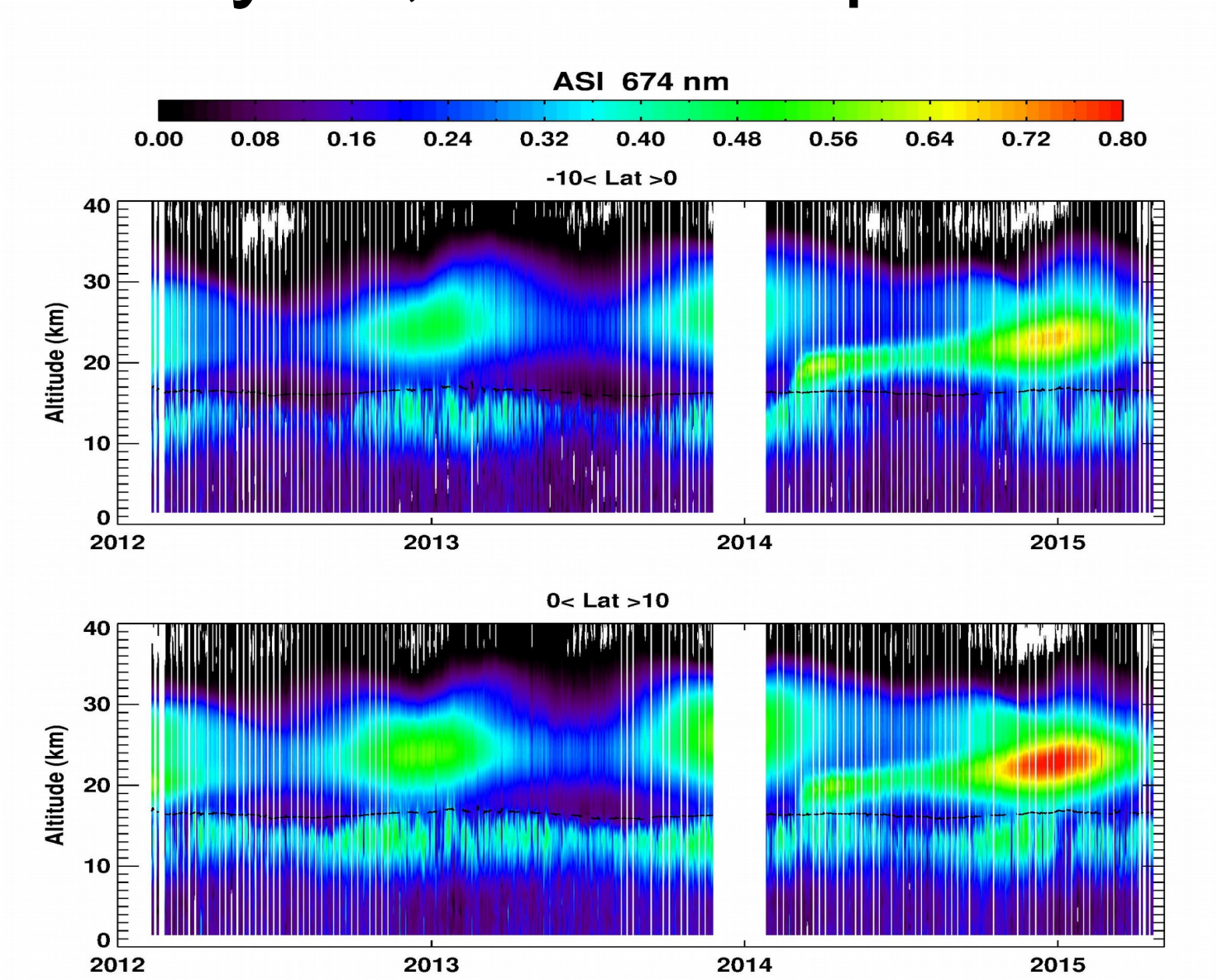
Outline

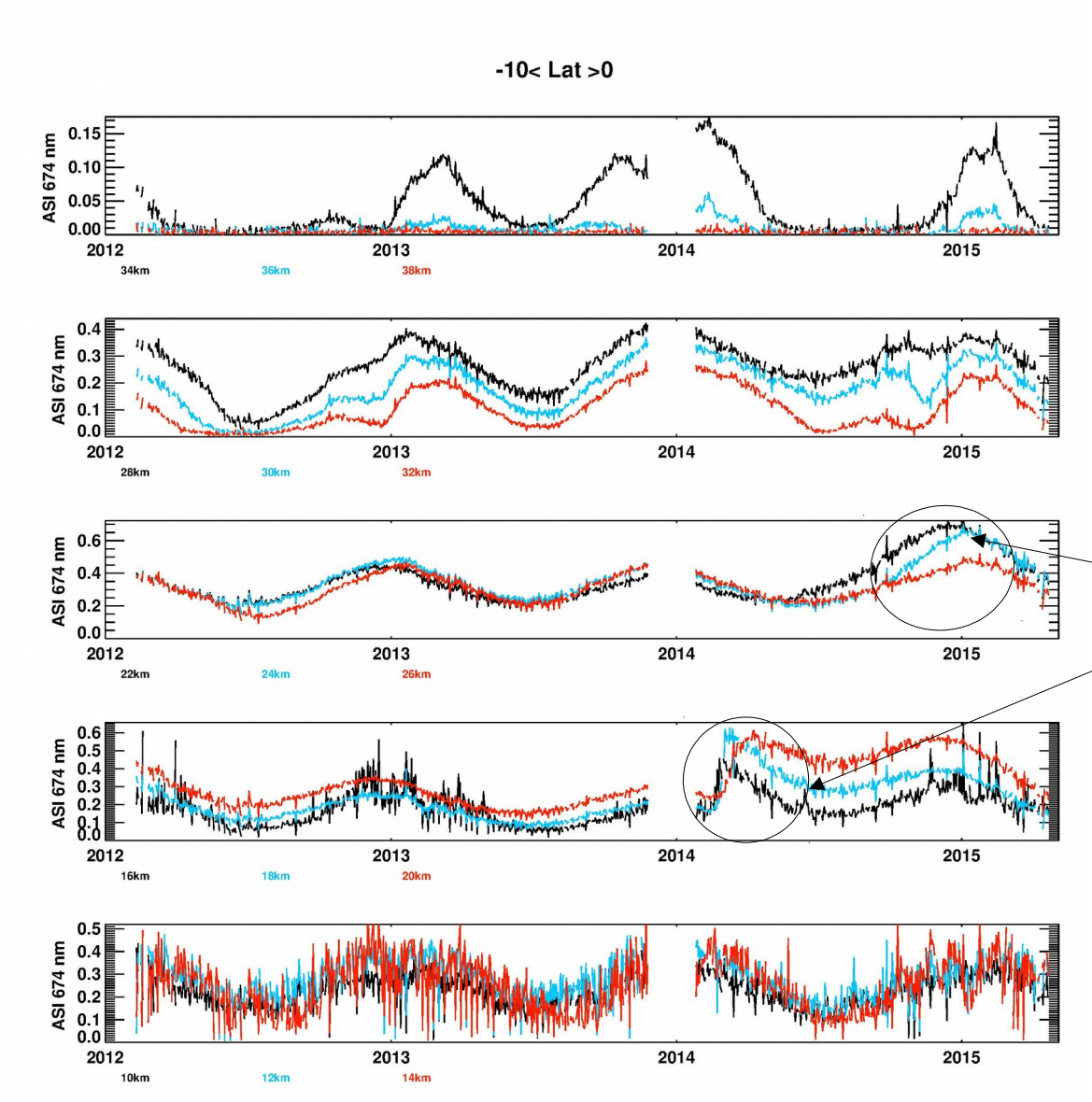
- Introduction
- Daily and monthly zonal mean aerosol index at 674nm
  - Seasonal cycle, Kelut eruption, Chelyabinsk meteor, cirrus and Polar stratospheric clouds
  - Daily maps
- Regression analysis and deseasonalized time series
- Early results of model comparison with OMPS

Introduction

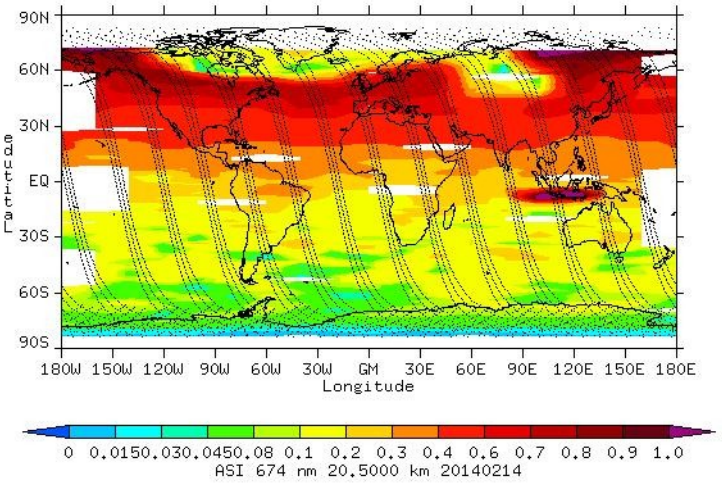
- ASI(674)=$\ln I_m - \ln I_{c0}$ normalized at 45 km
- Single Scatter Angle (SSA) vary between 165^o-23^o for events 1-180 (SH to NH)
- ASI is proportional to aerosol extinction and varies along the orbit by a factor of 10

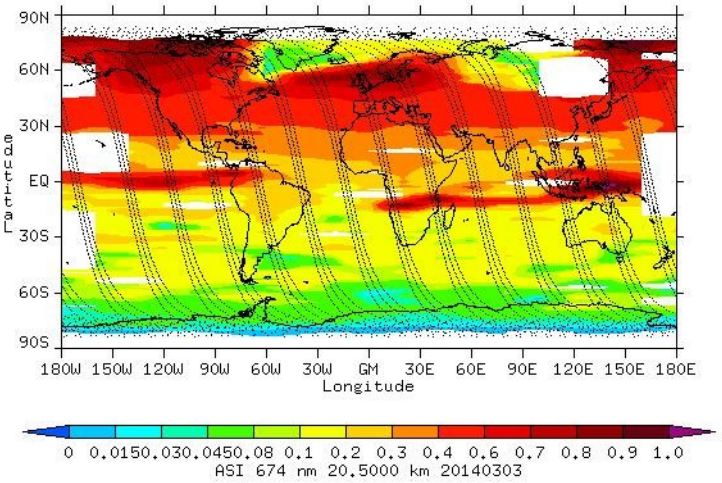
Aerosol and cirrus clouds seasonal cycle, Kelut eruption

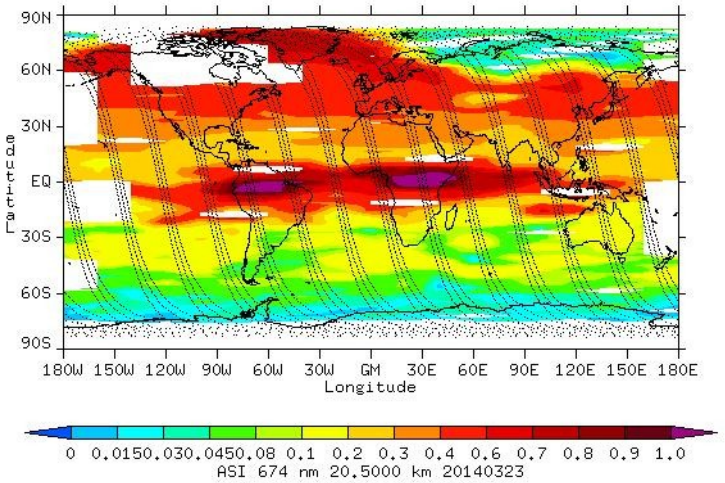


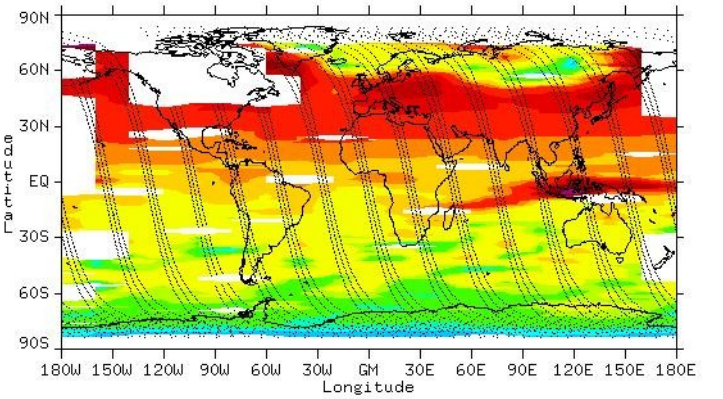


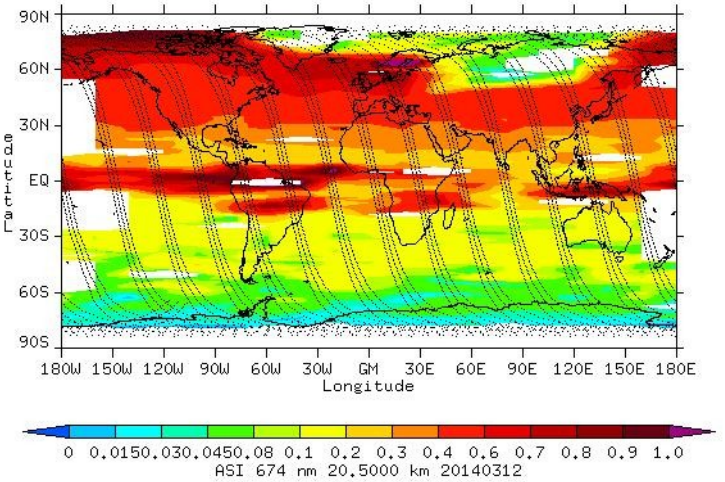
Volcanic plume
vertical transport

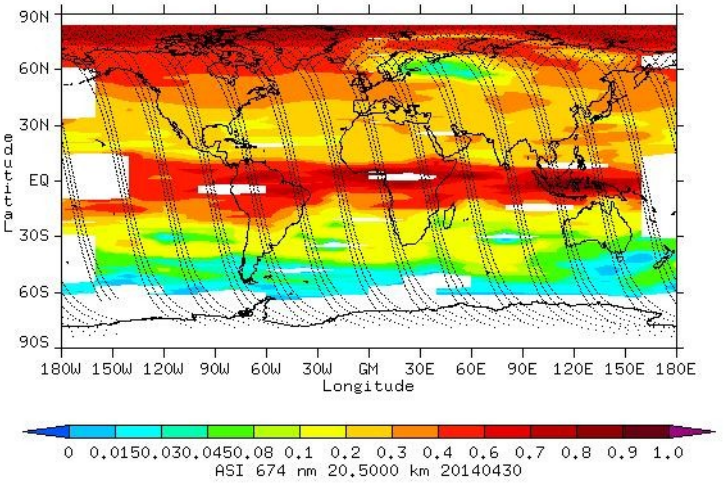












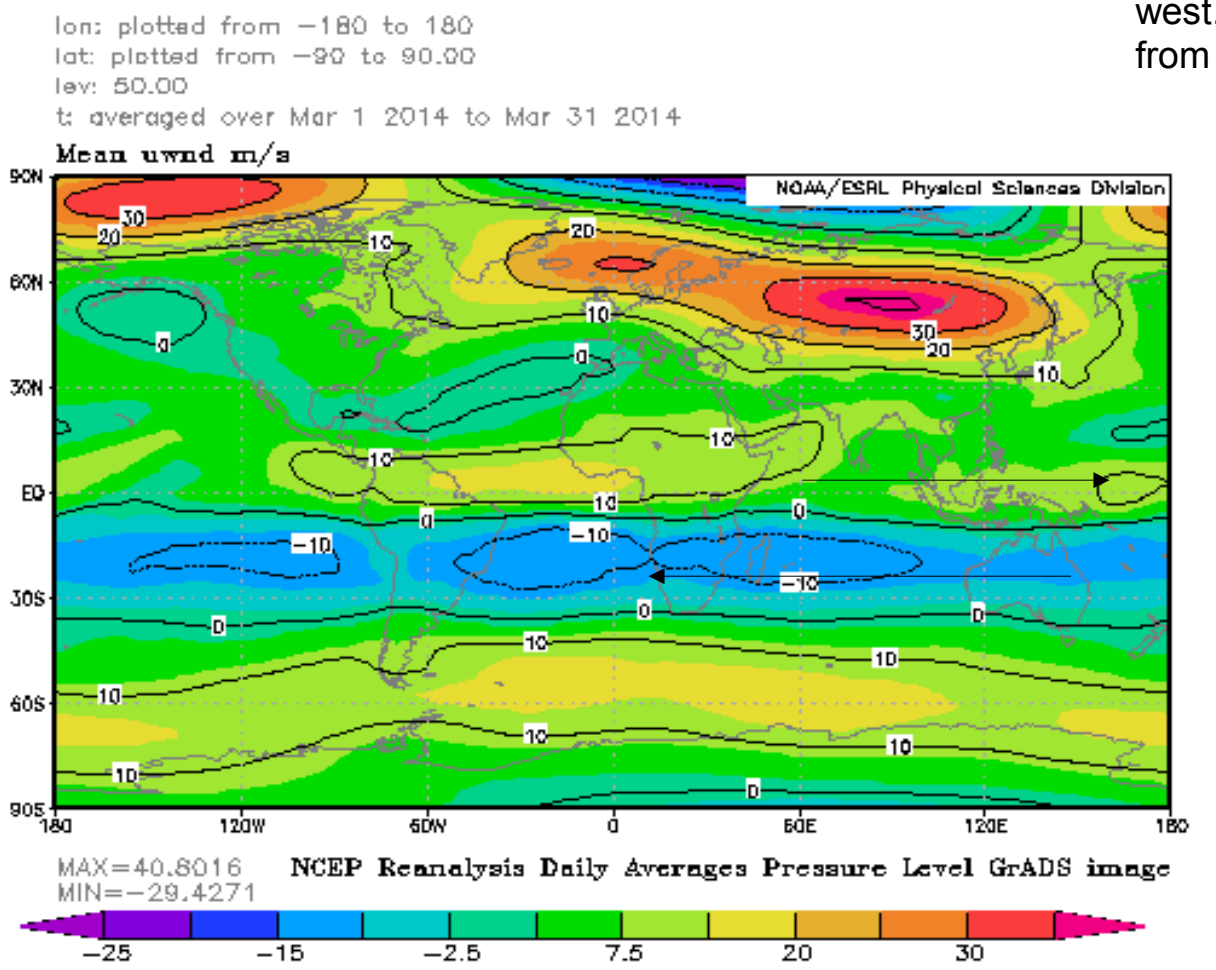
ASI daily maps

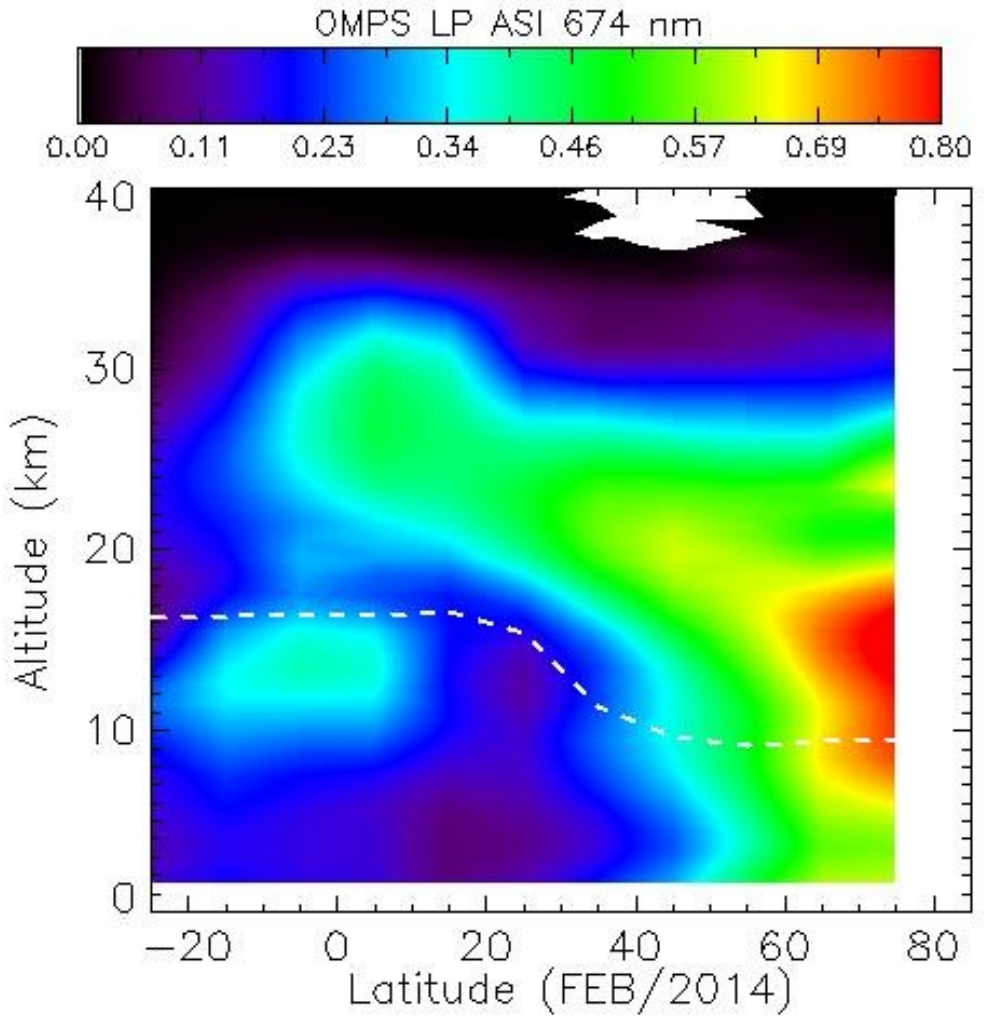
Tracking Kelut plume 20.5 km

-In the tropics, aerosol rapidly transport zonally with the mean stratospheric wind

NCEP Reanalysis U-wind m/s for march 2014

A positive u wind is from the west. A negative u wind is from the east

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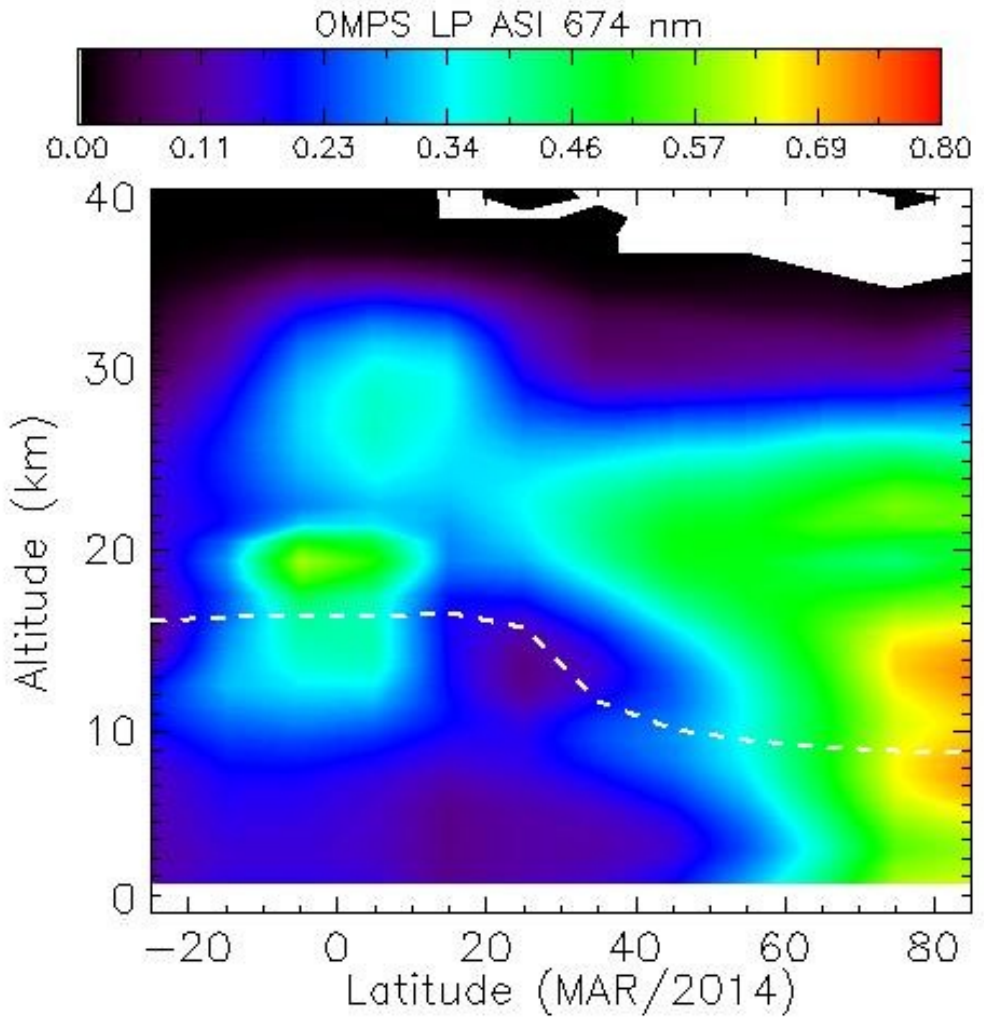
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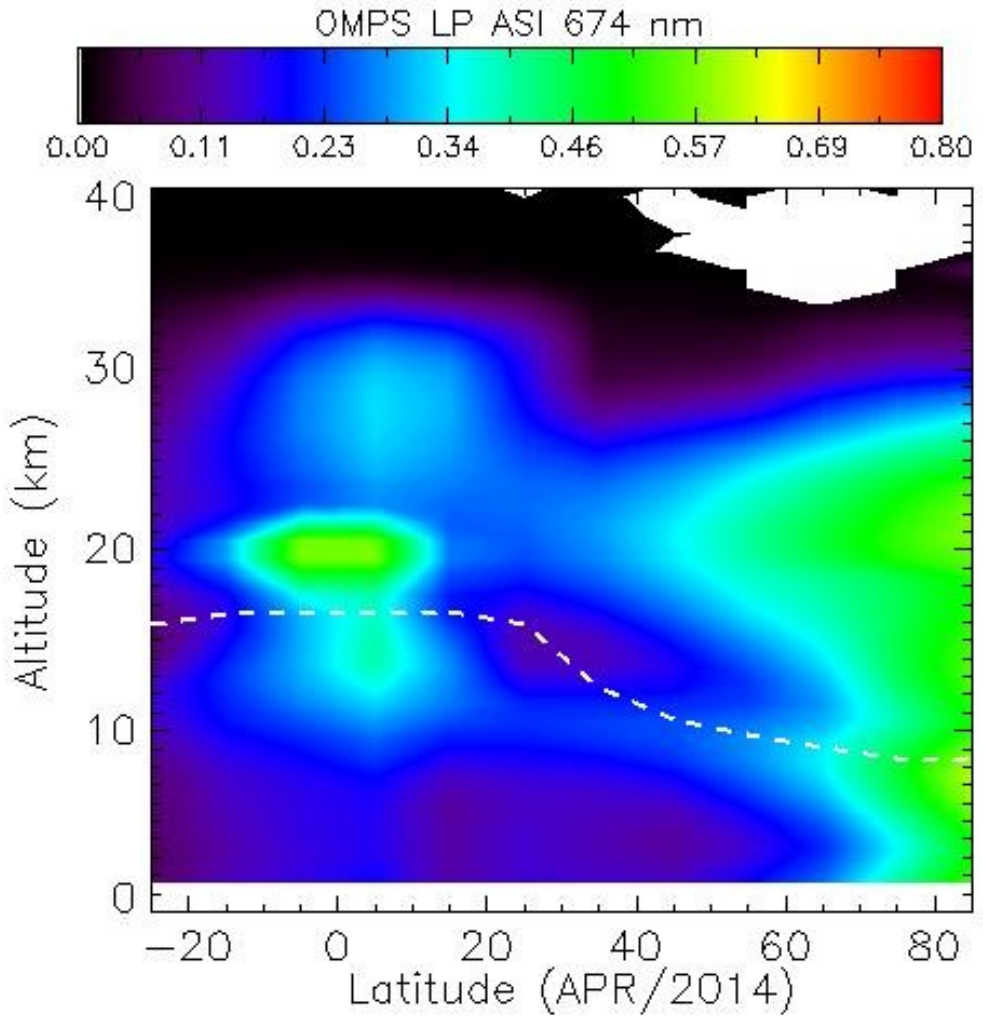
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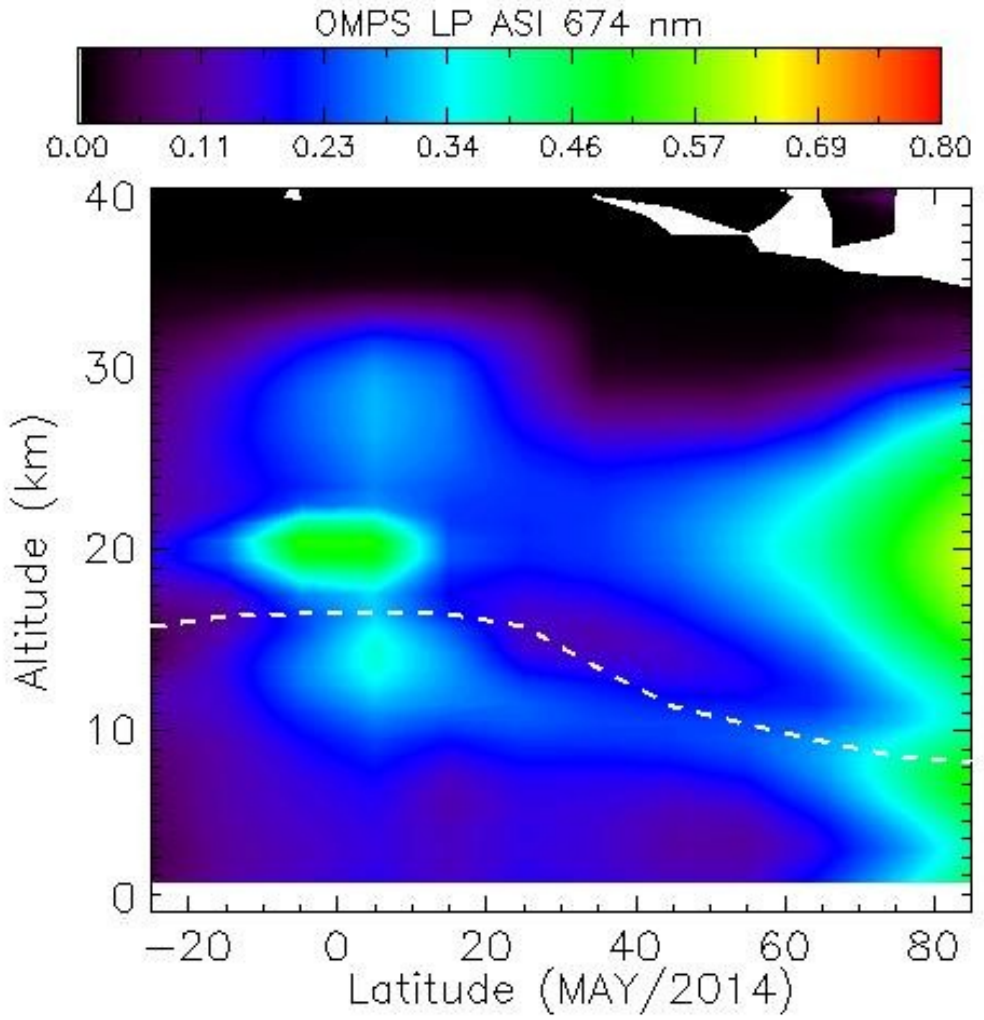
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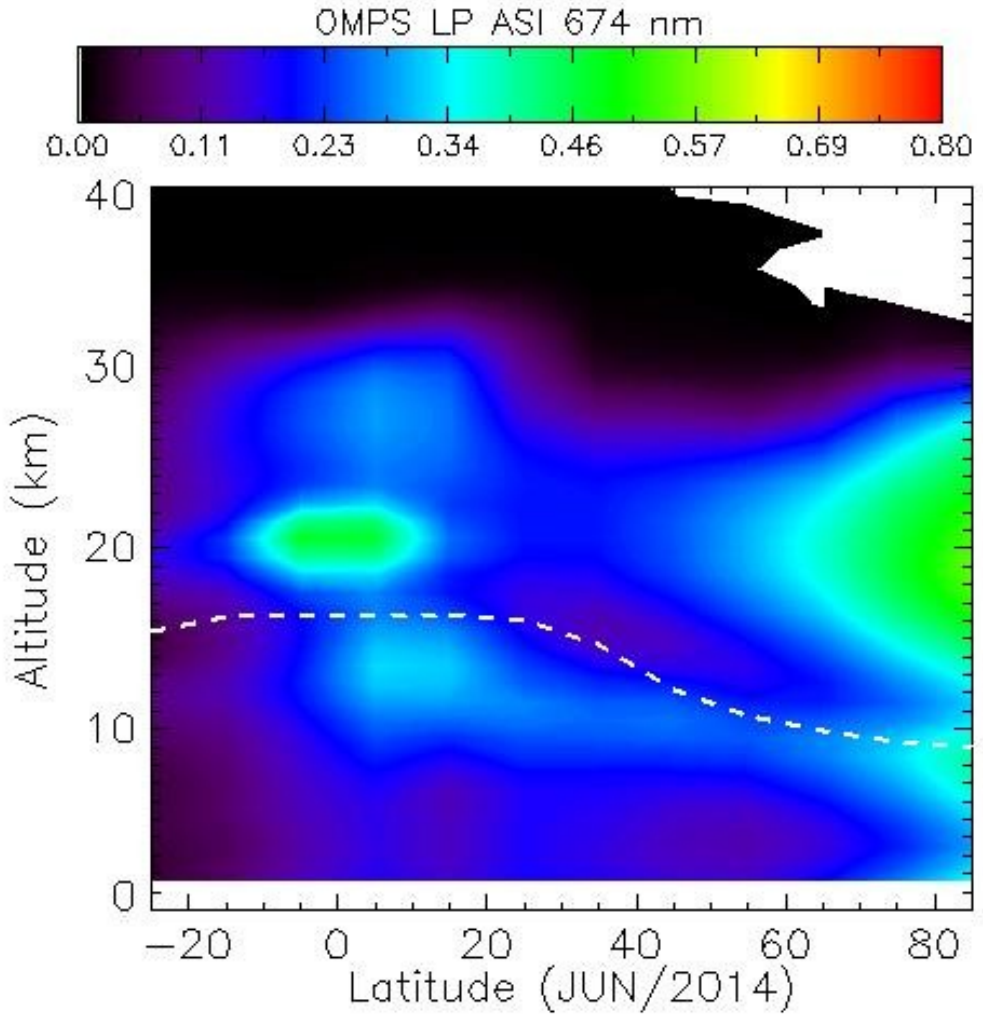
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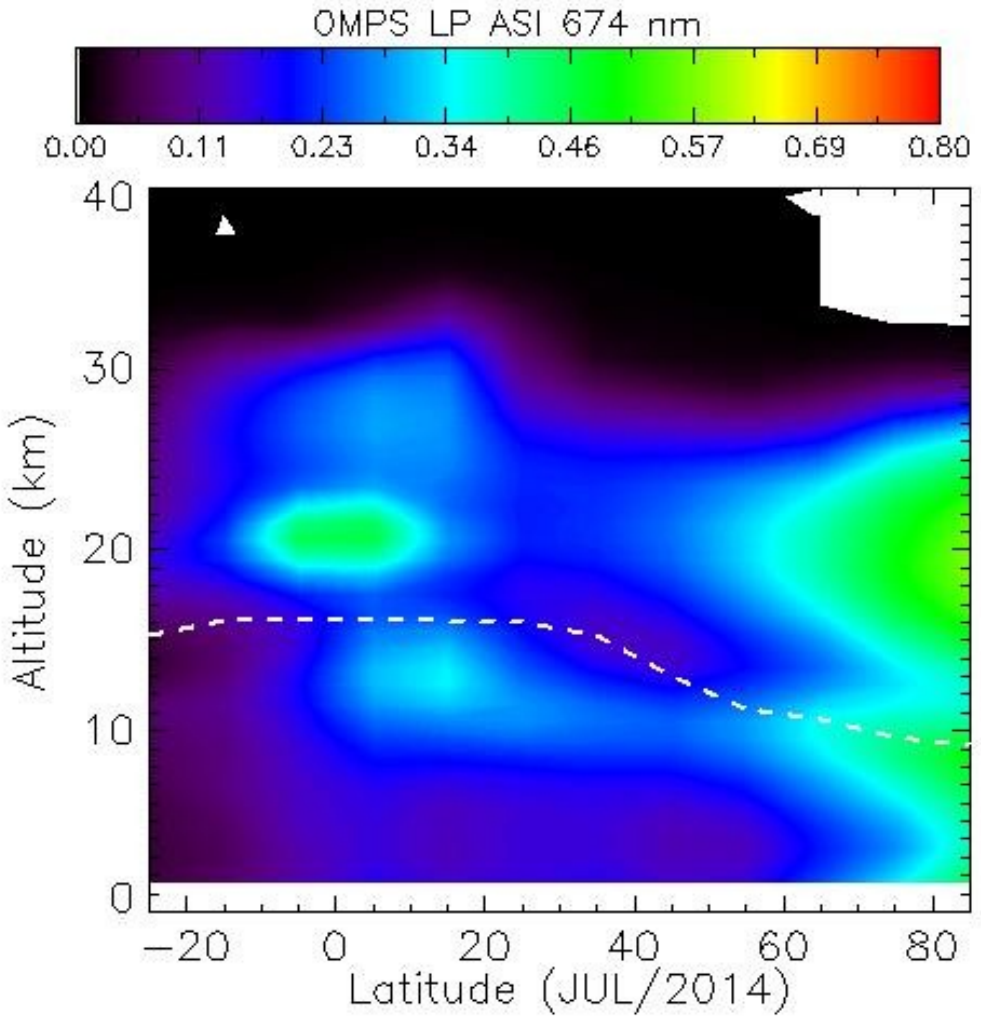
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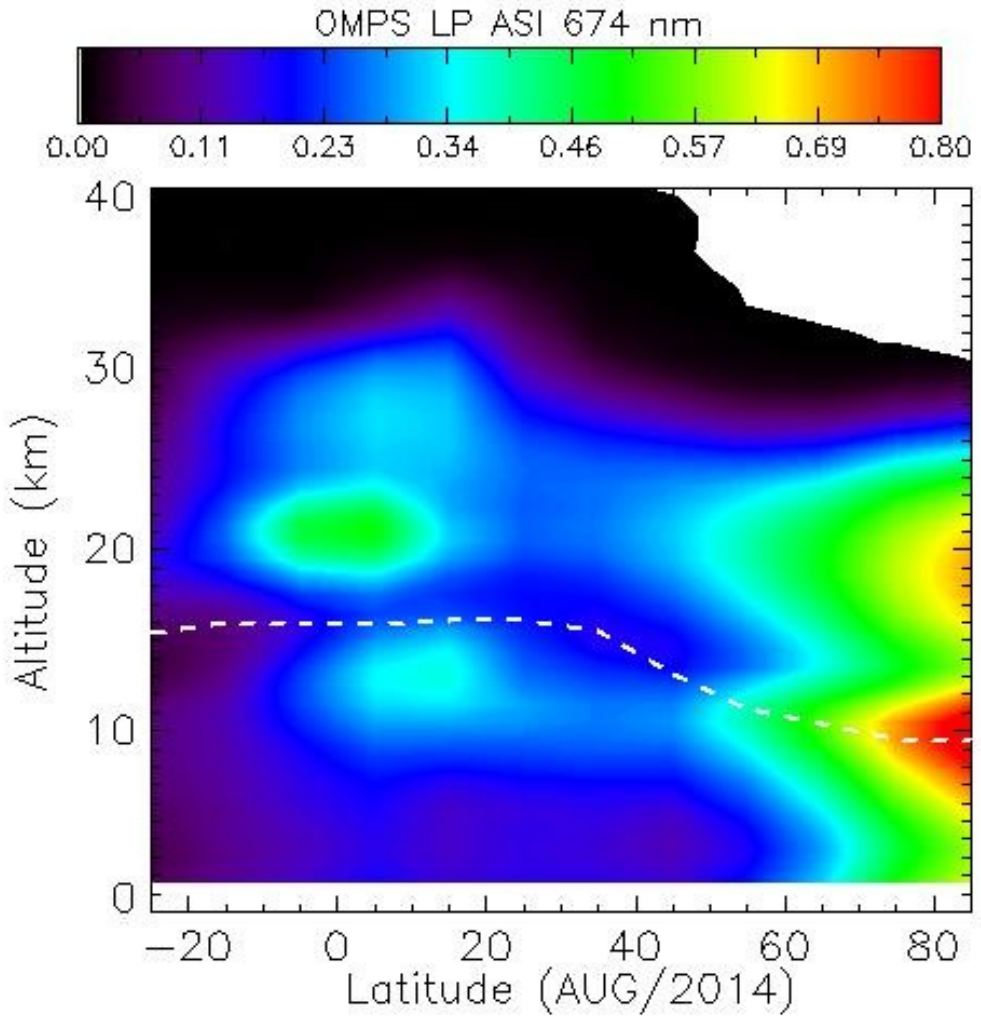
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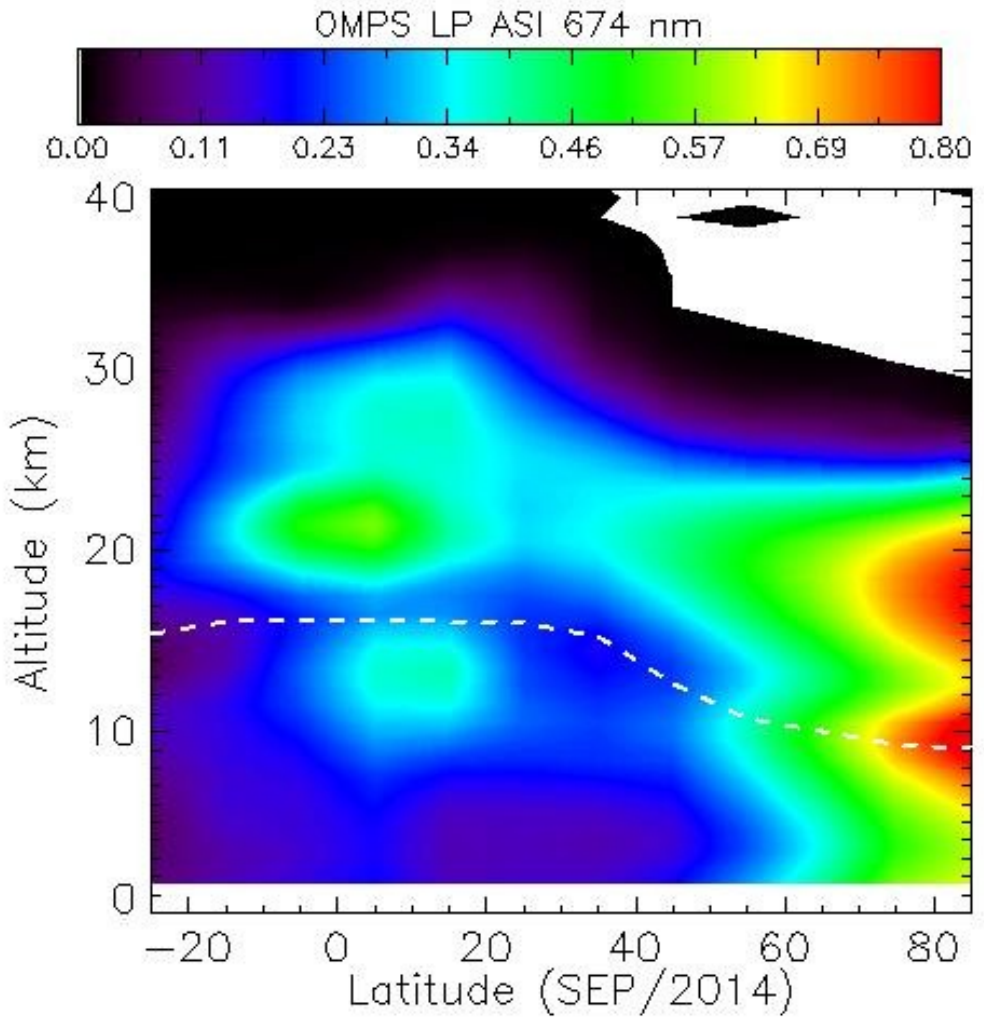
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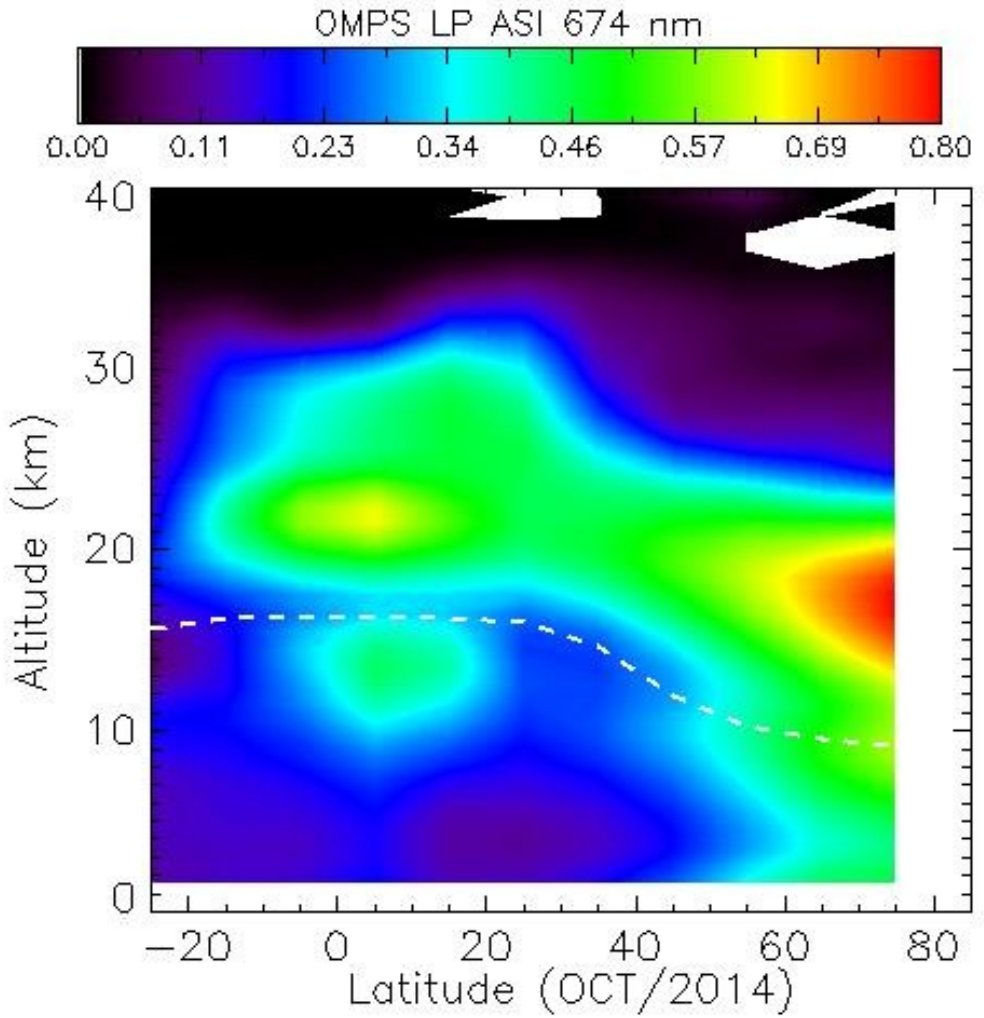
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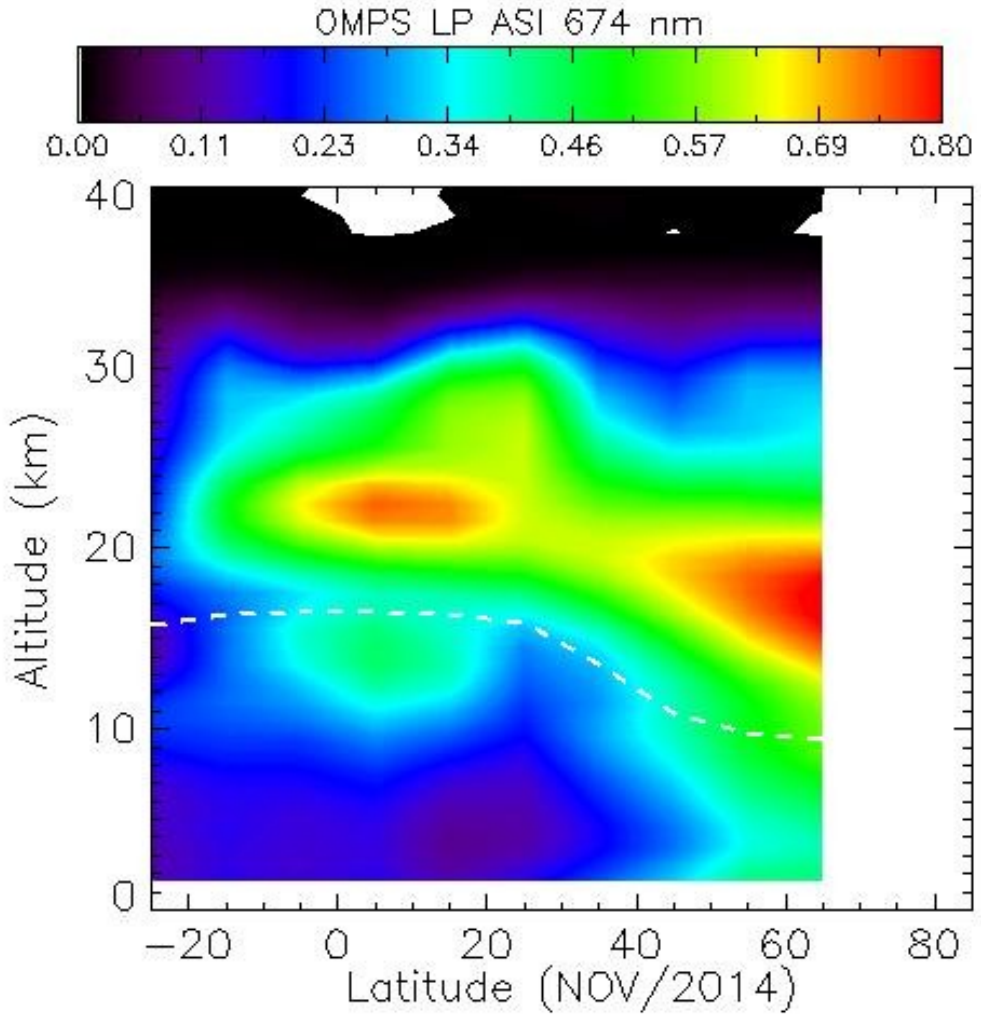
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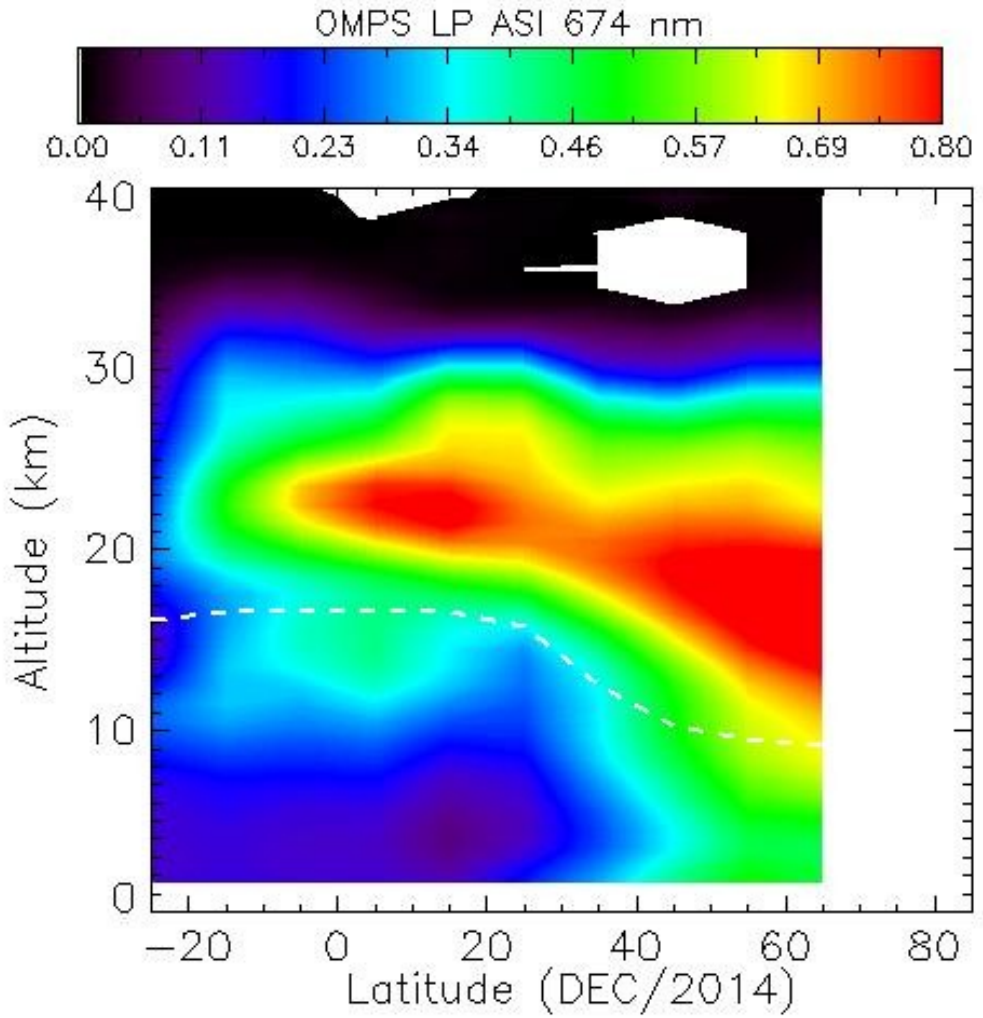
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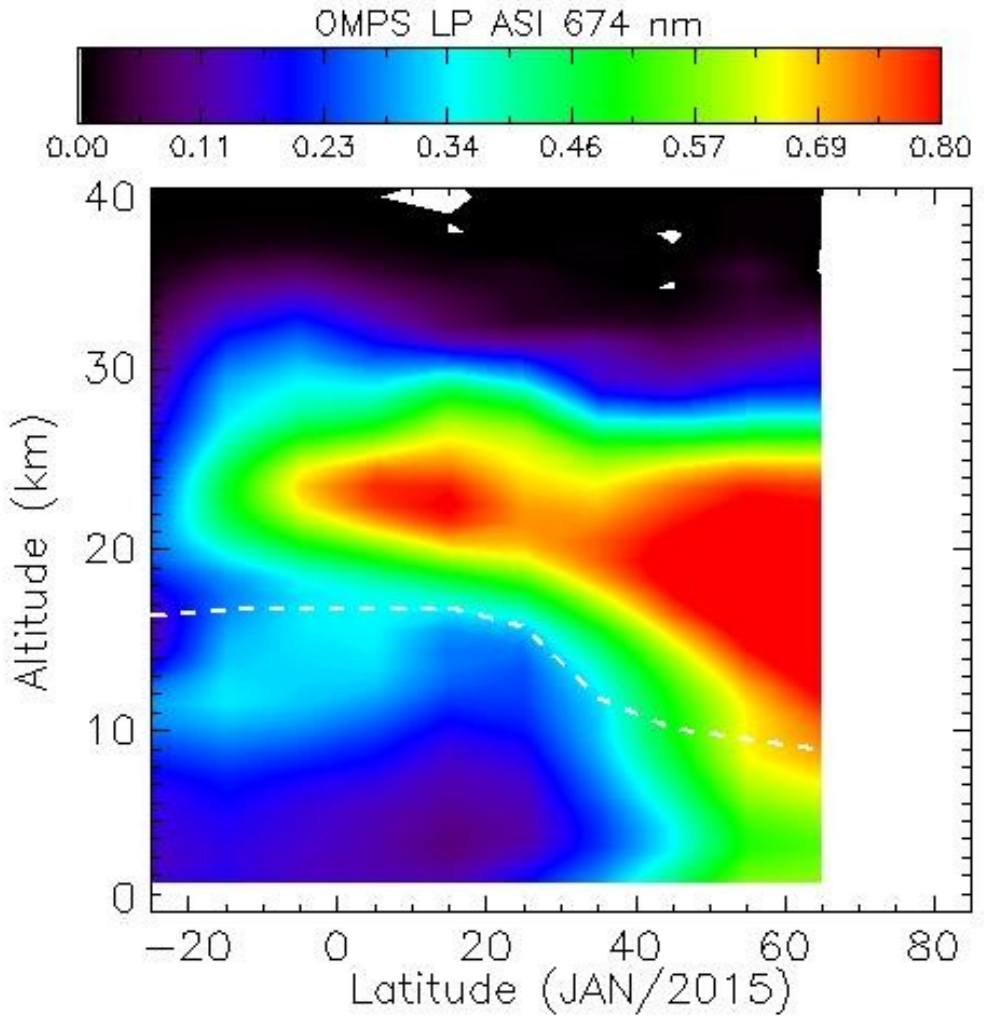
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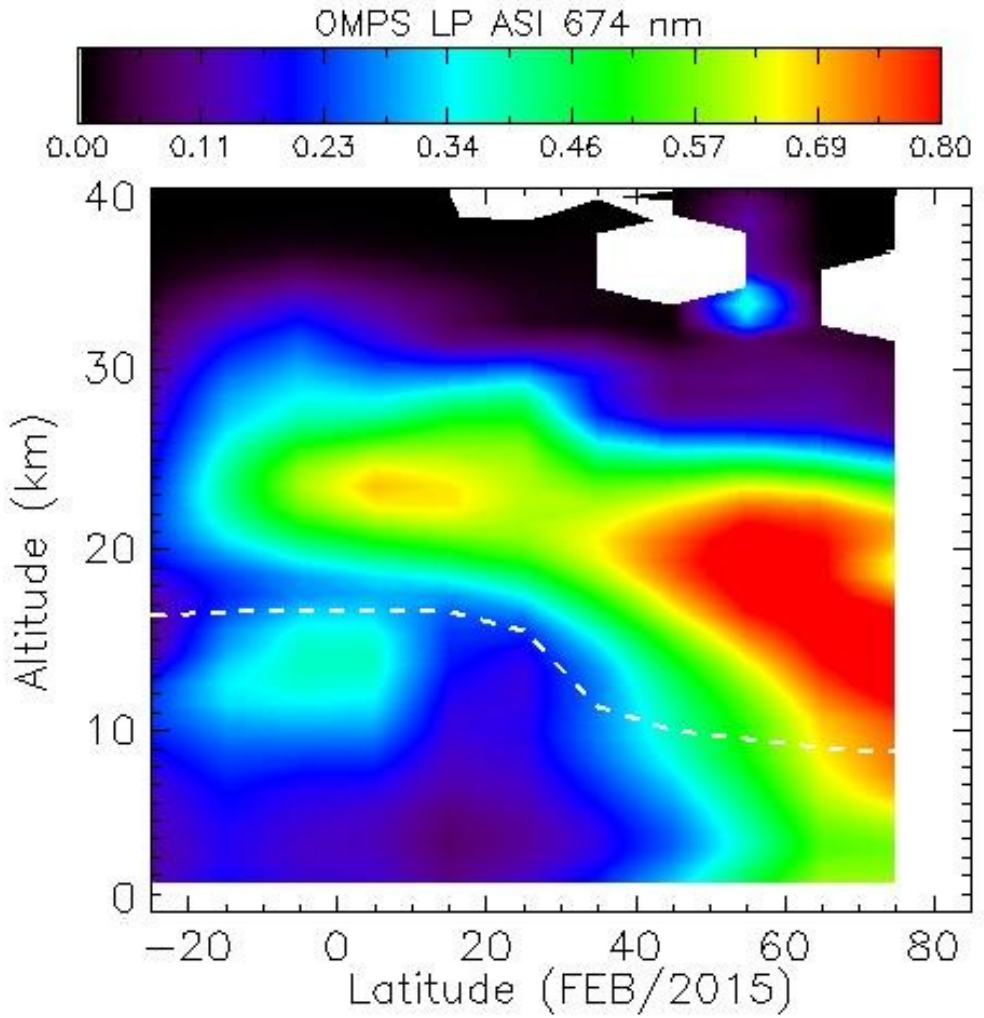
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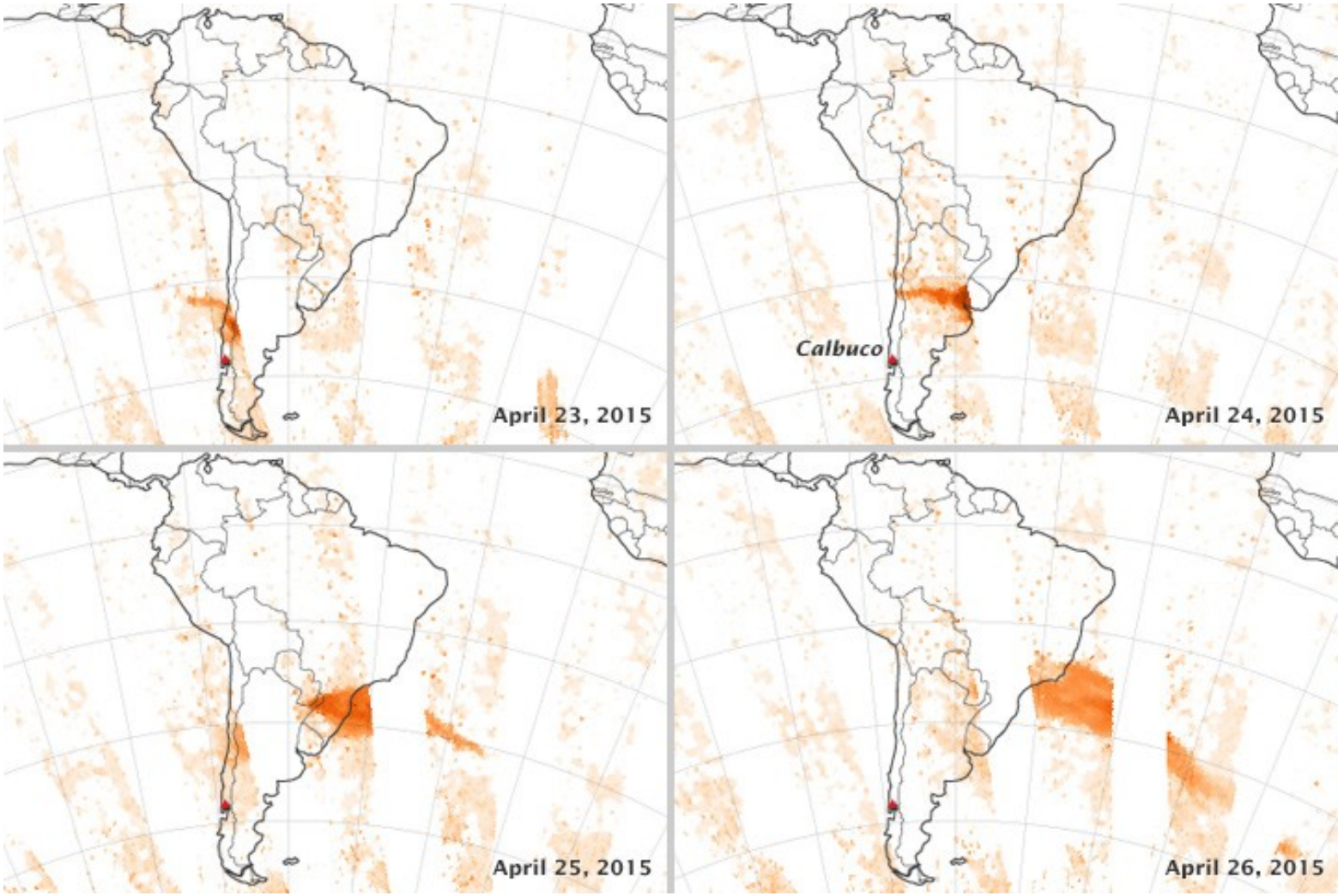
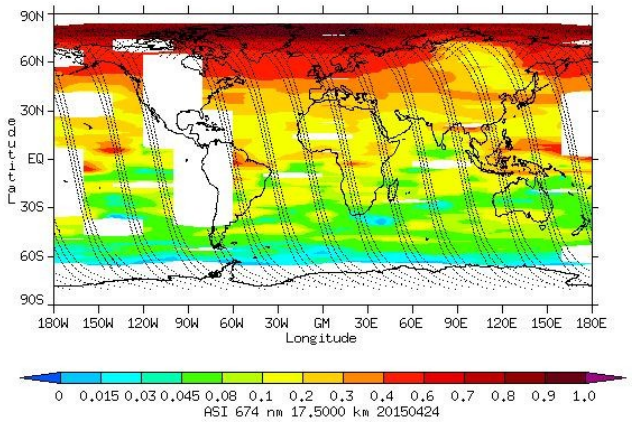
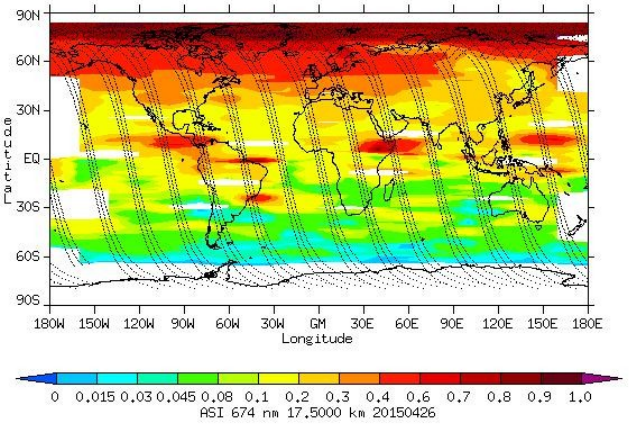
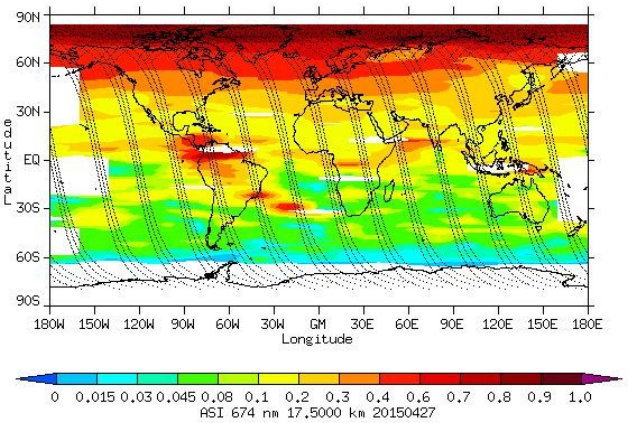
Latitude (FEB/2015)

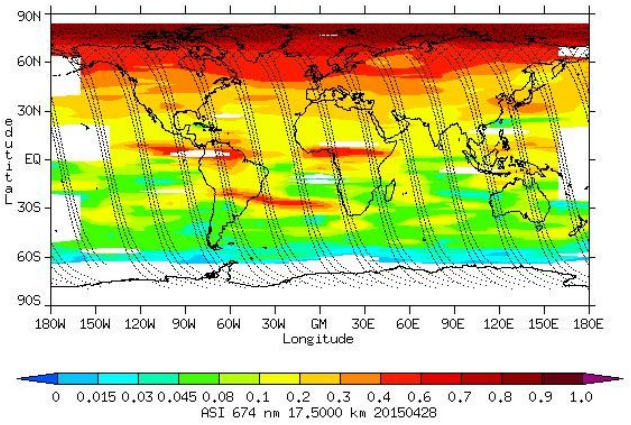
Calbuco volcano OMI of SO2

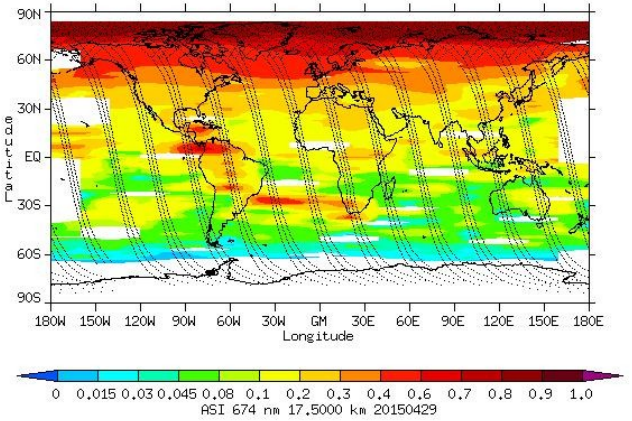


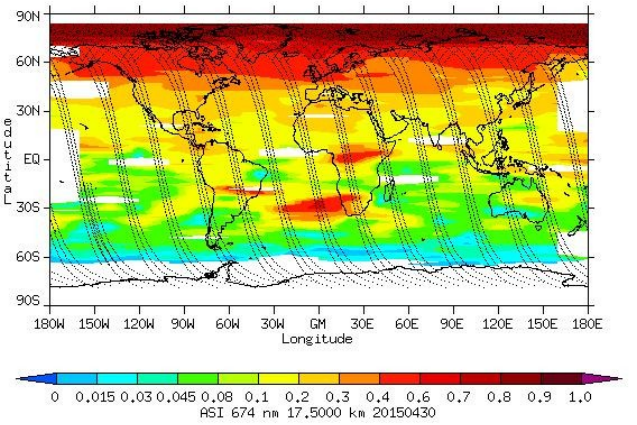


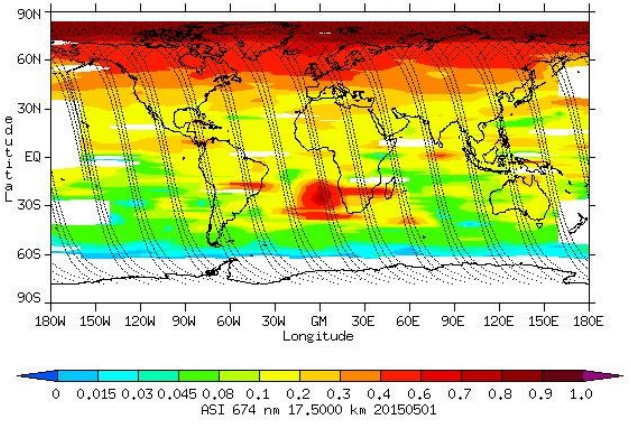


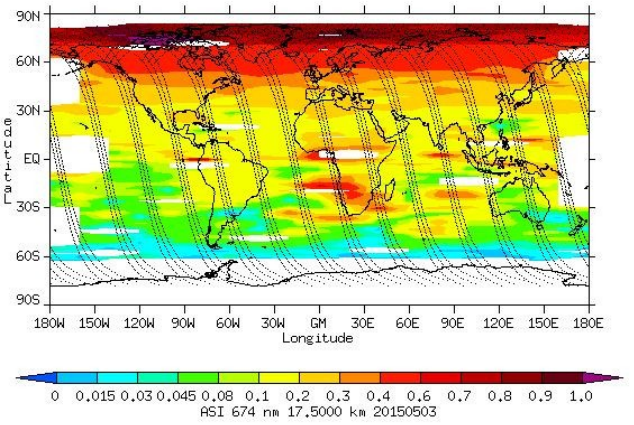


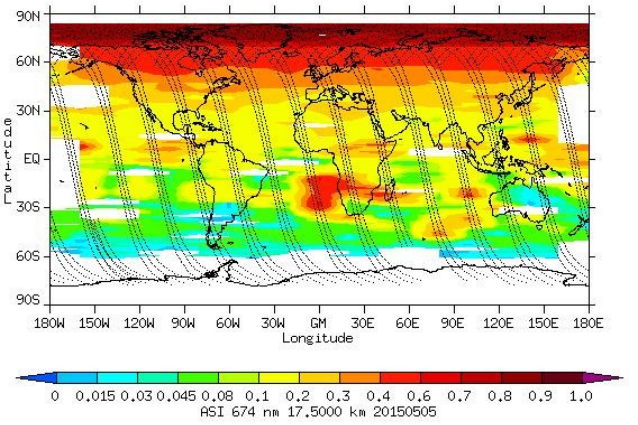






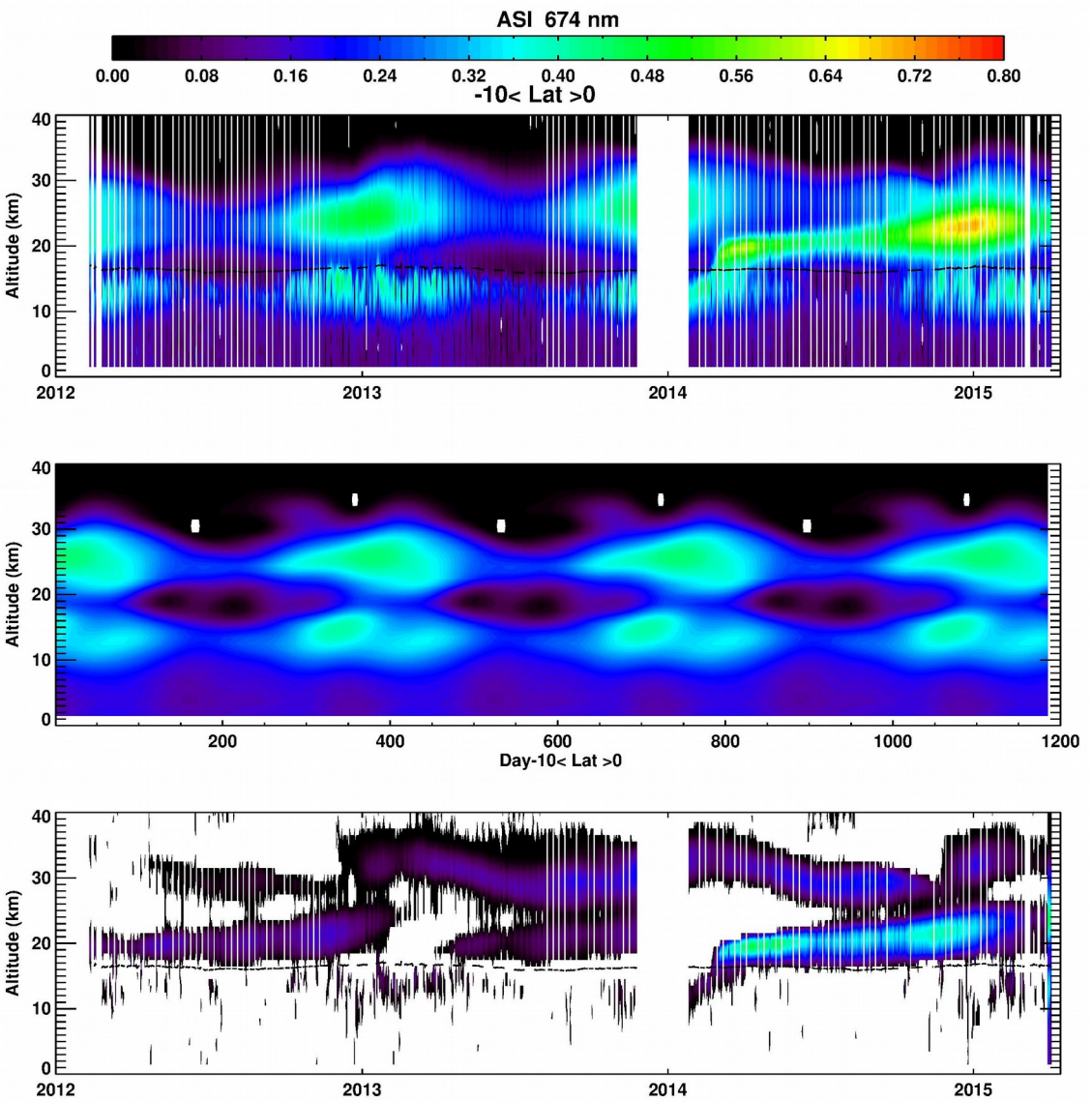






Calbuco volcano OMPS LP ASI at 17.5 km

Deseasonalized time series

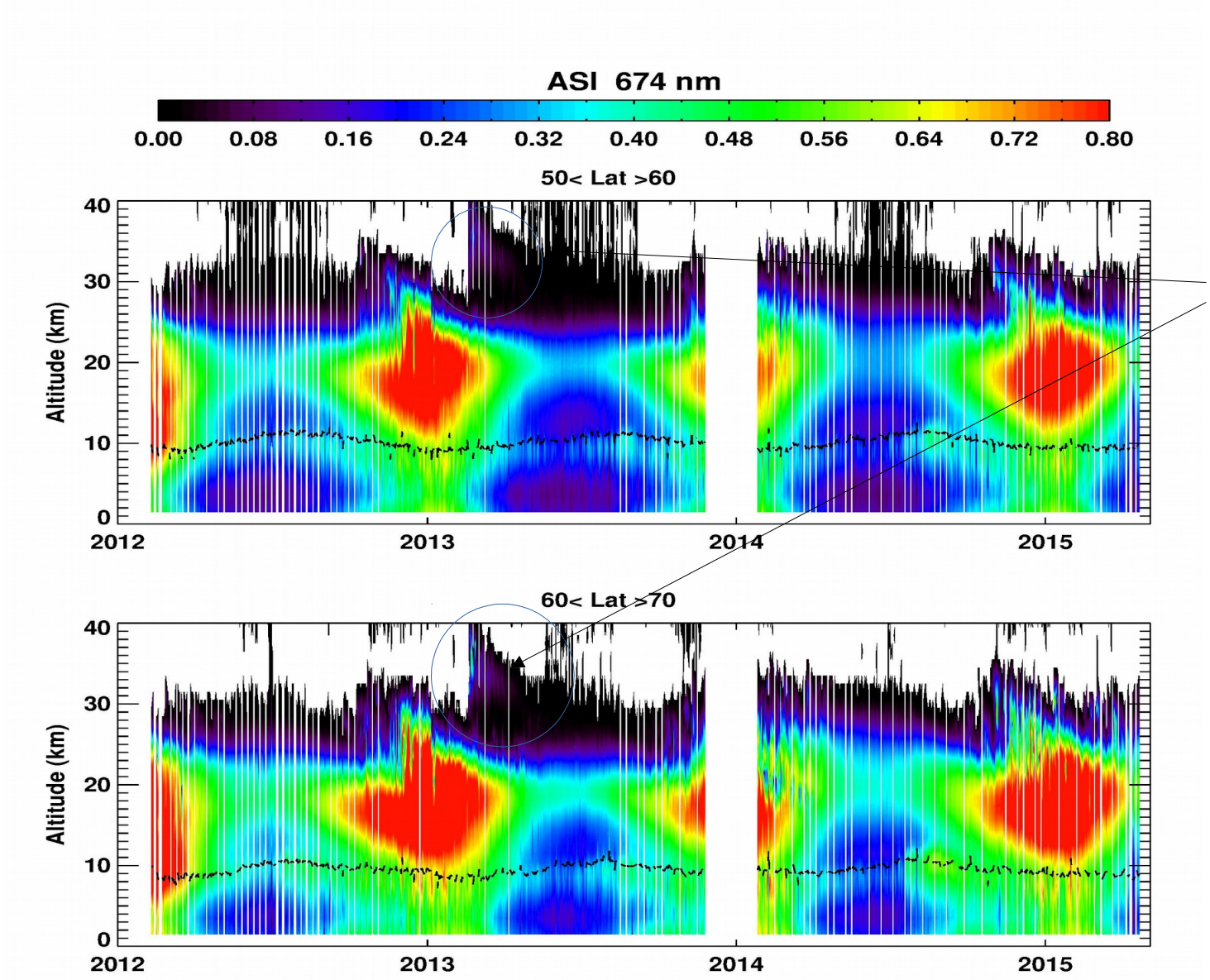


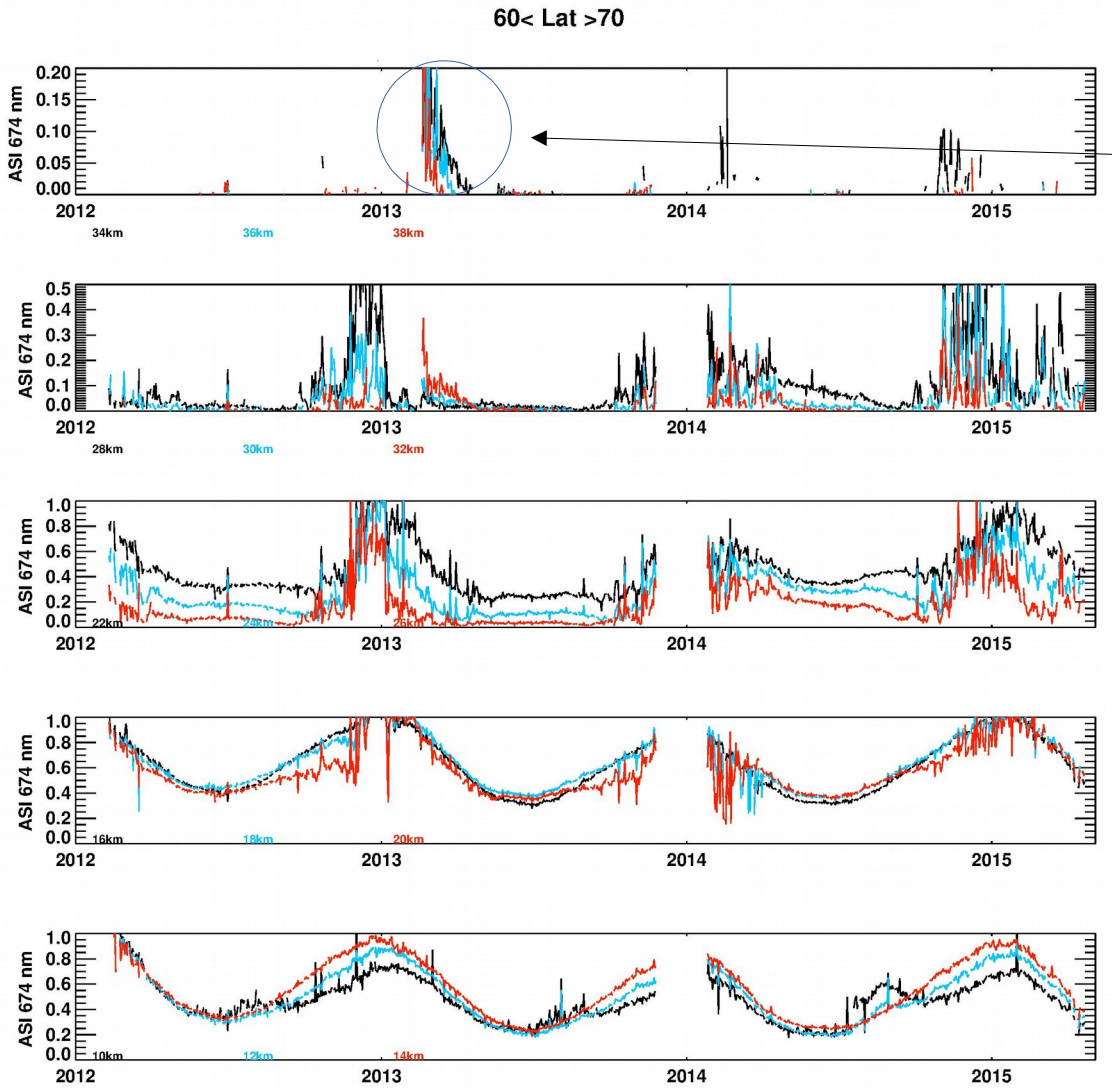
Daily zonal mean in the tropics

Modeled annual and semi-annual cycles

Deseasonalized zonal means show Nabro (6/13/2011) and Kelut (2/13/2014) volcanic aerosol plumes

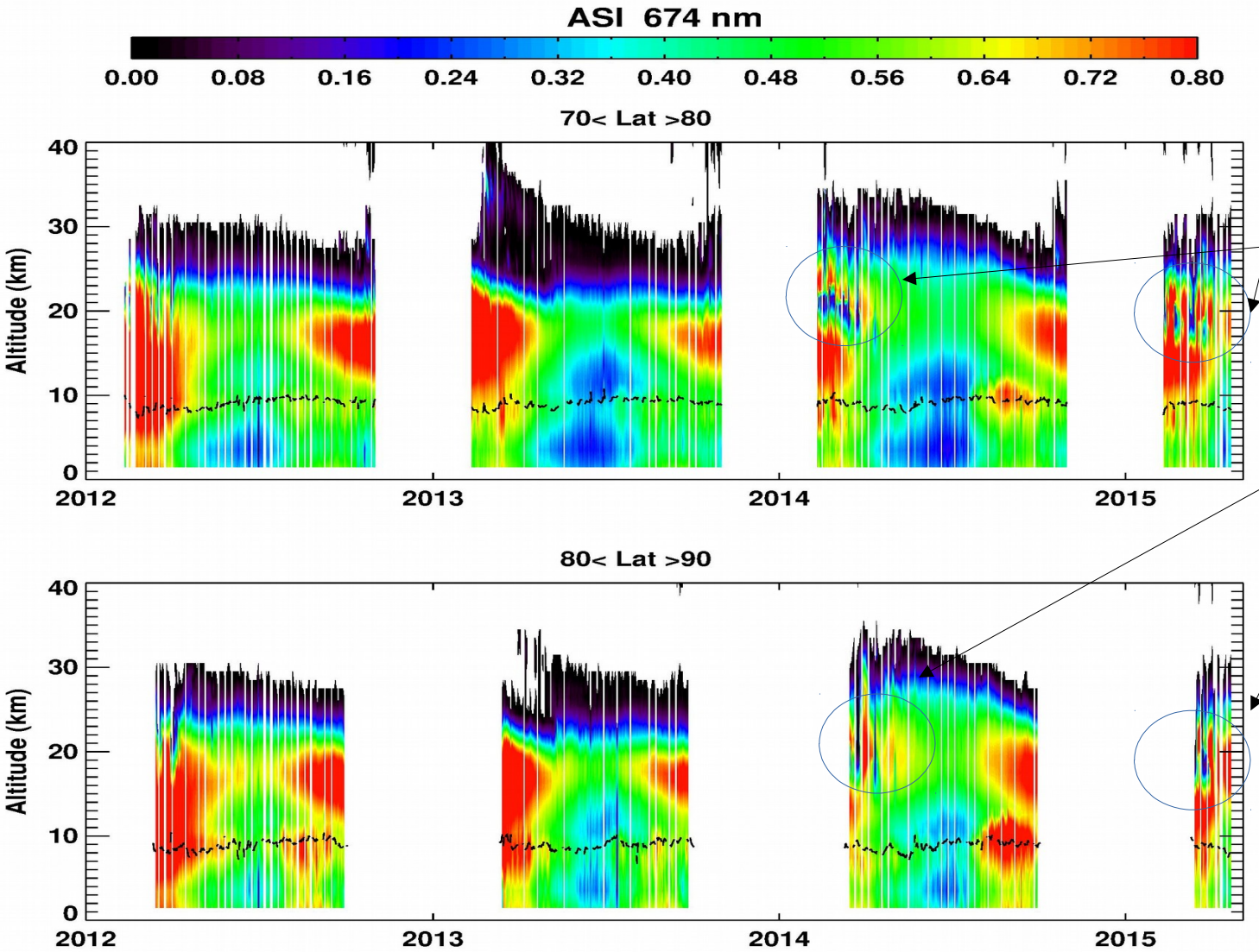
Chelyabinsk meteor





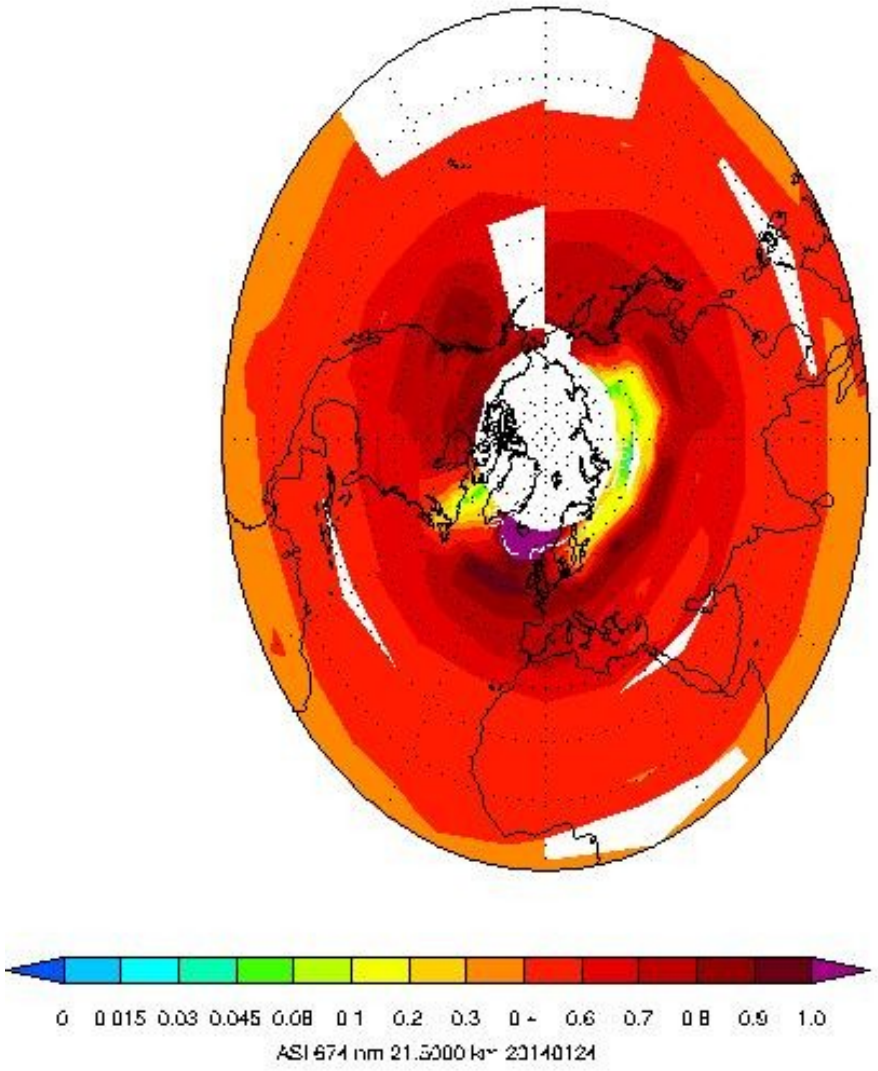
Meteor plume

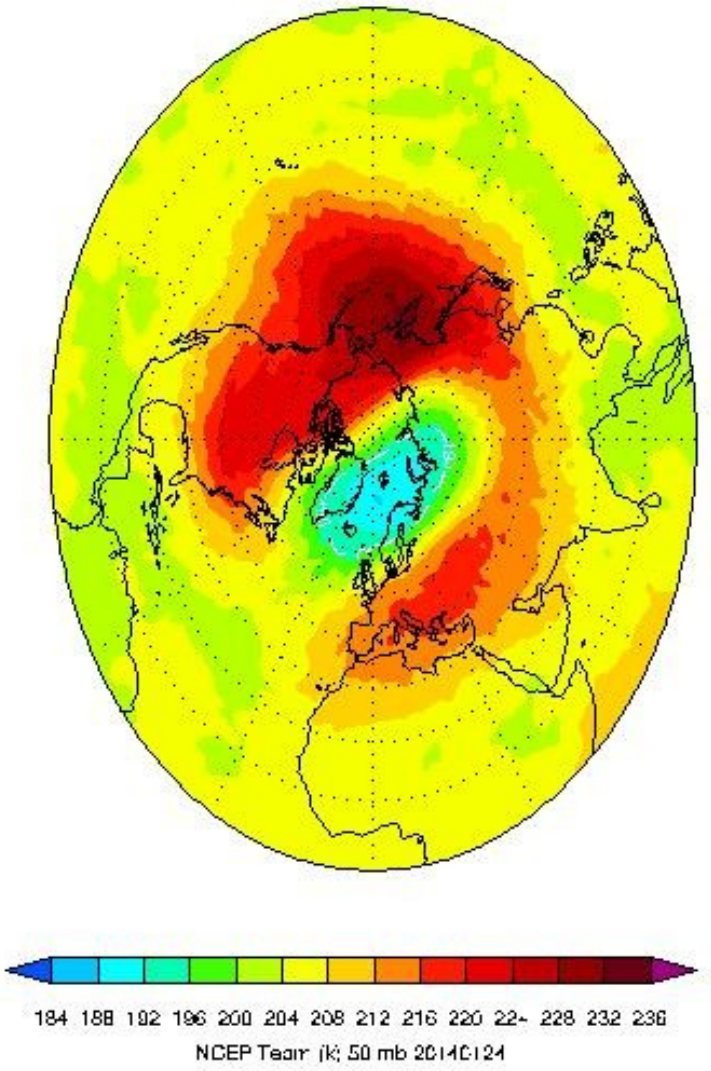
PSCs or aerosol?



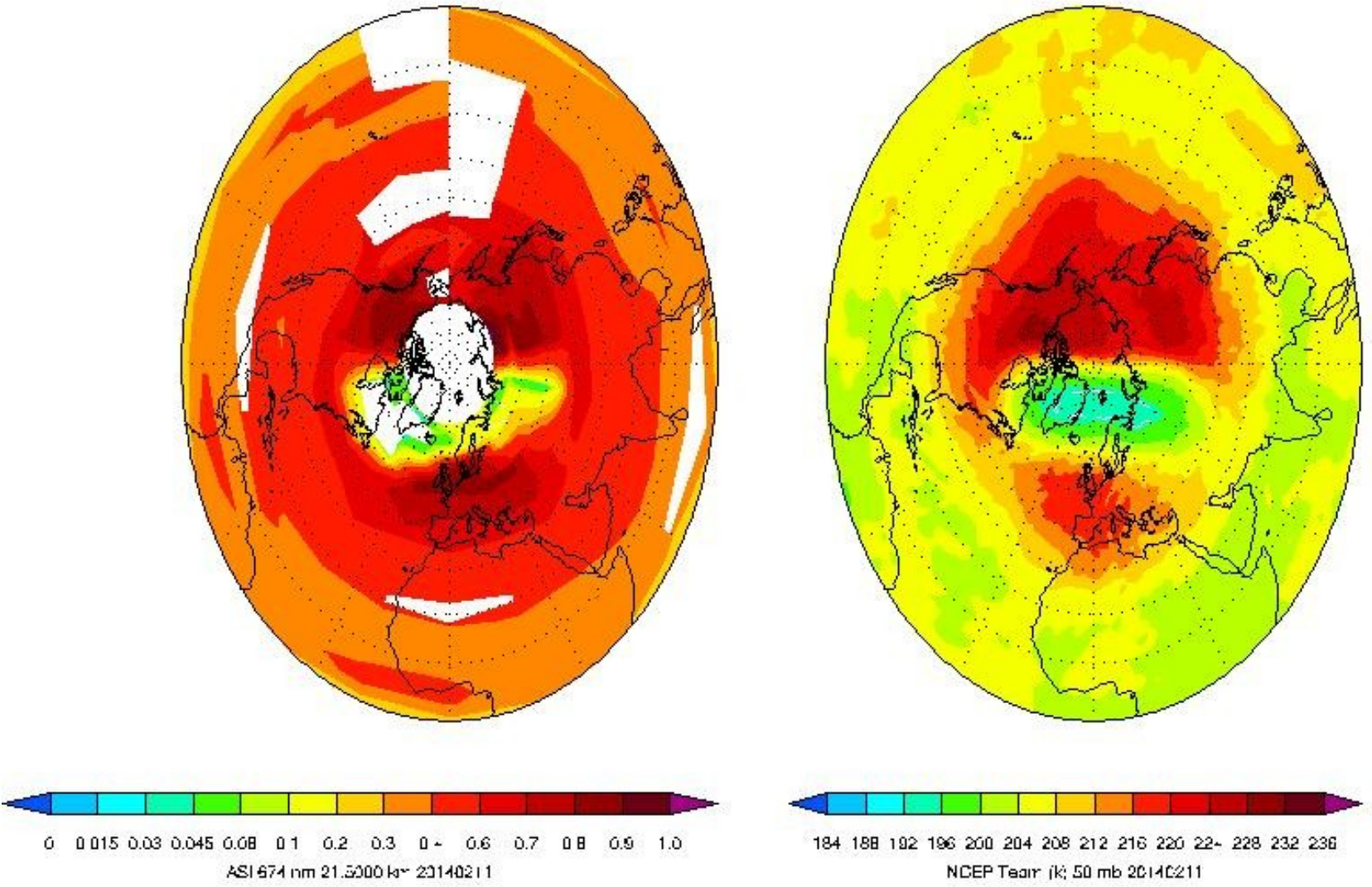
slow descent of the lower stratospheric temperature minimum inside the vortex, either PSCs or low aerosol loading (due to diabatic subsidence). High aerosol outside the vortex

OMPS daily ASI 21.5 km and NCEP TEMP 50mb, 20140124

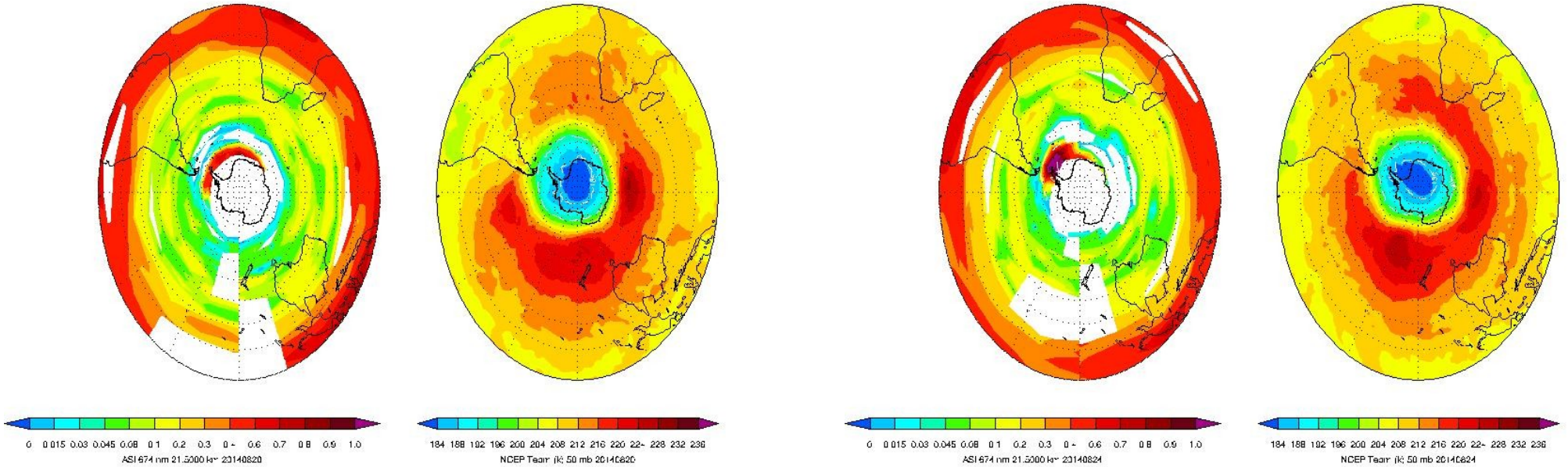




OMPS daily ASI 21.5 km and NCEP TEMP 50mb, 20140211



SH PSC's

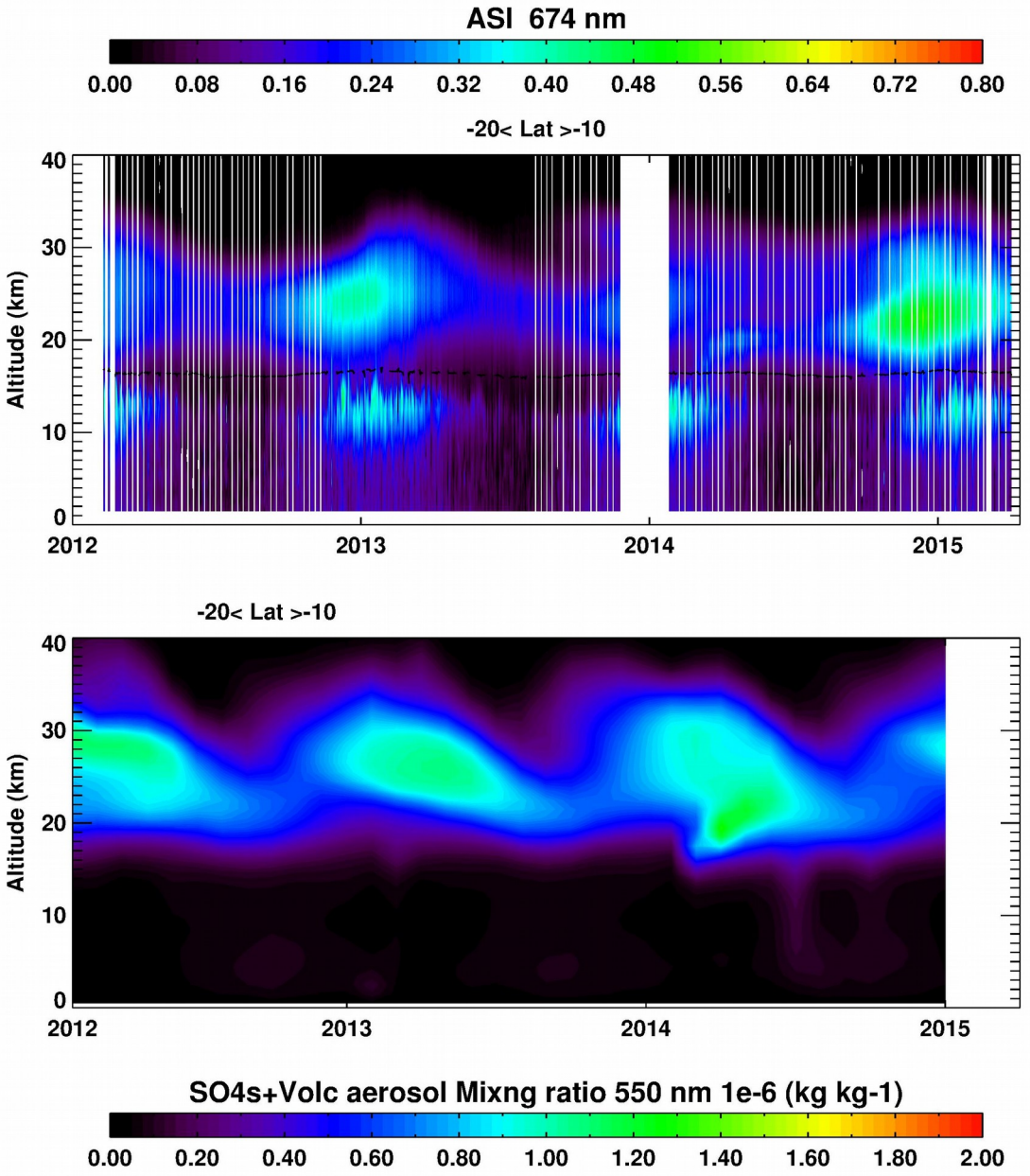


OMPS daily ASI 21.5 km and NCEP TEMP 50mb, 20140820 and 20140824

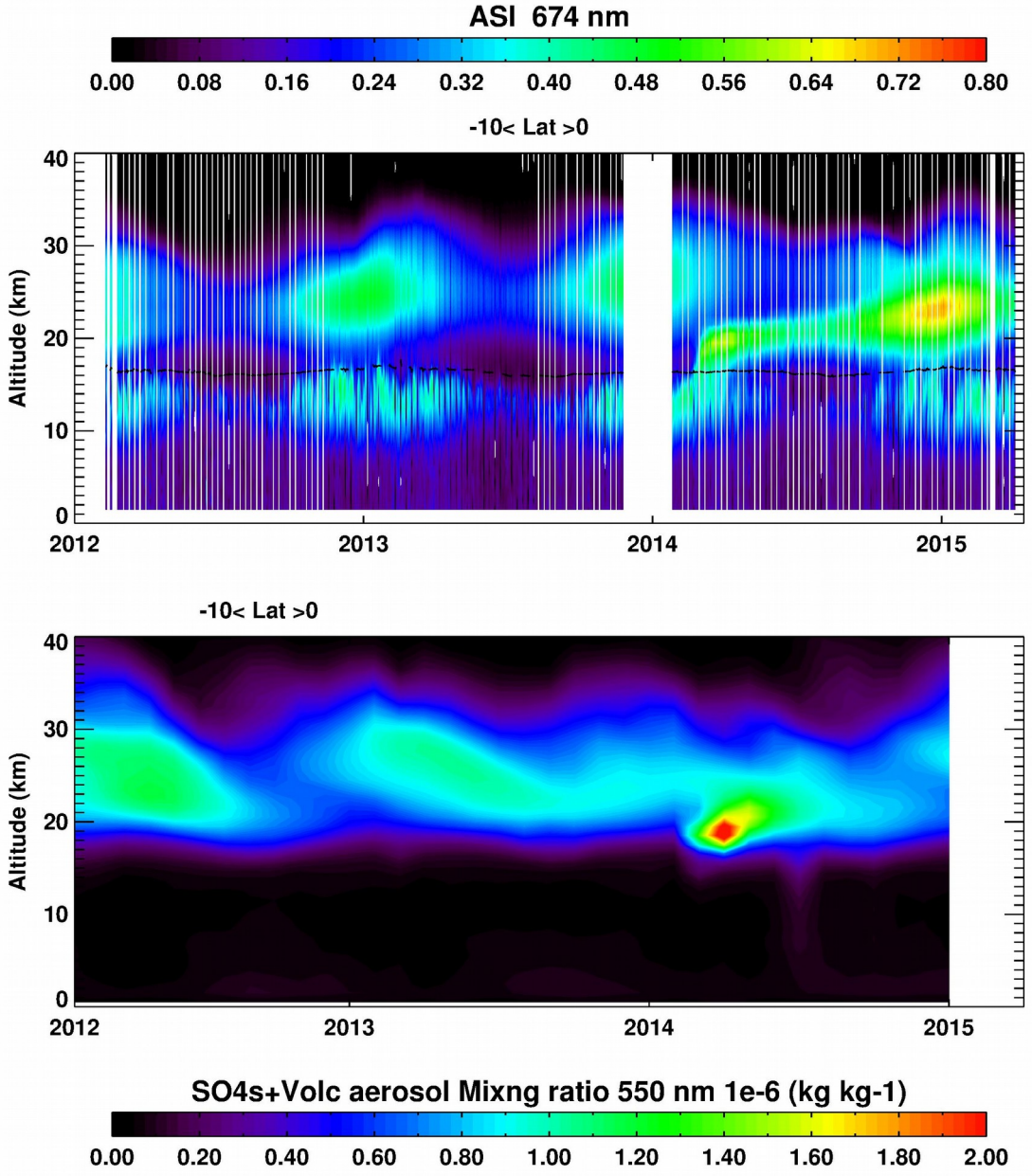
Model vs ASI

- Compare only stratospheric components
  - USE only carbonyl sulfide (OCS) and volcanic aerosol mixing ratio
  - OCS originate in the troposphere + OCS chemical reaction in the stratosphere (SO4s)
- Use mixing ratio rather than extinction coefficient
- Very early results!!!!!

OMPS vs SO4s+volc



OMPS vs SO4s+volc



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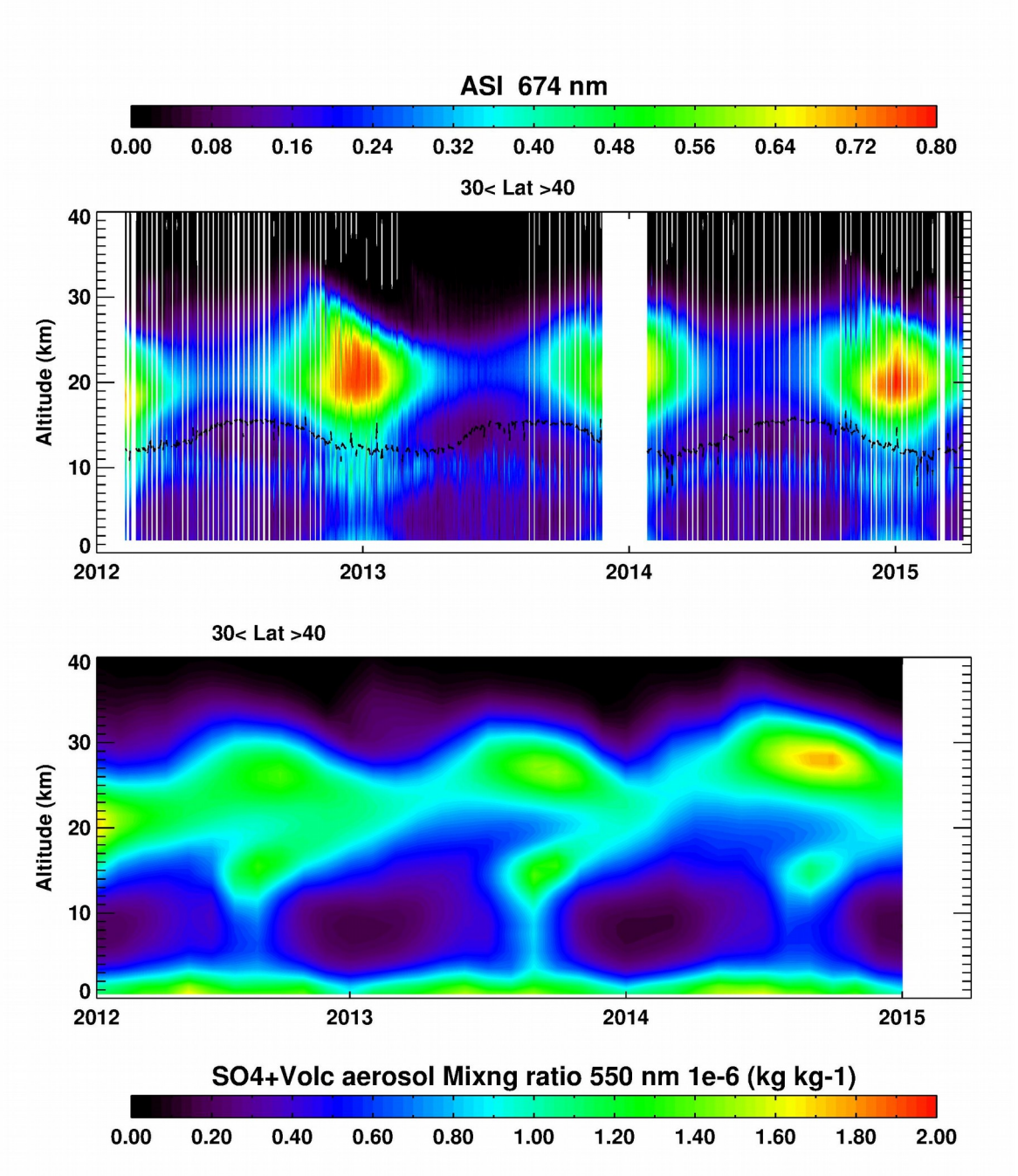
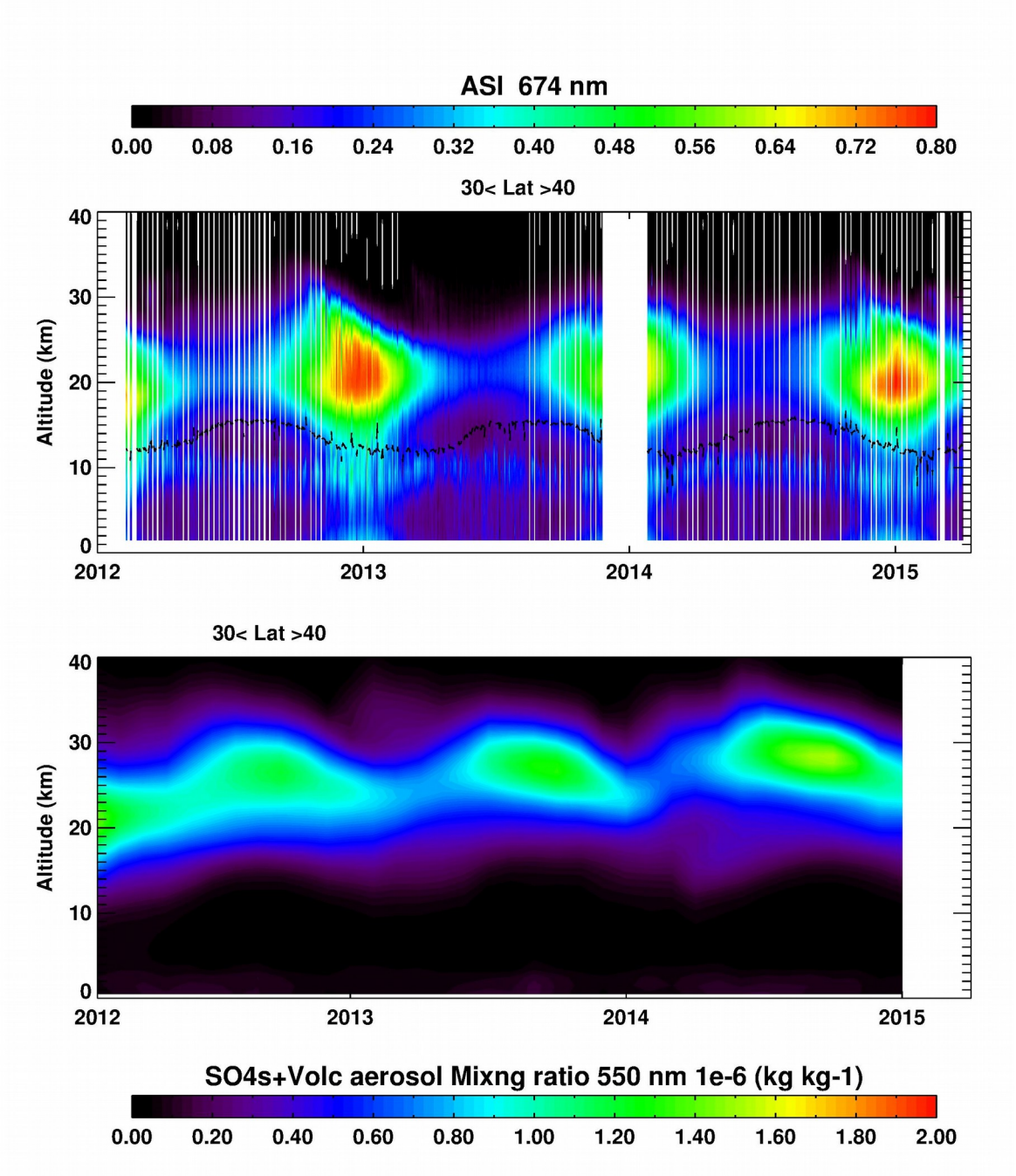
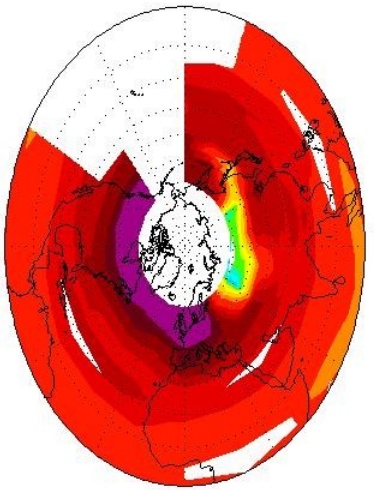


OMPS vs SO4s+volc





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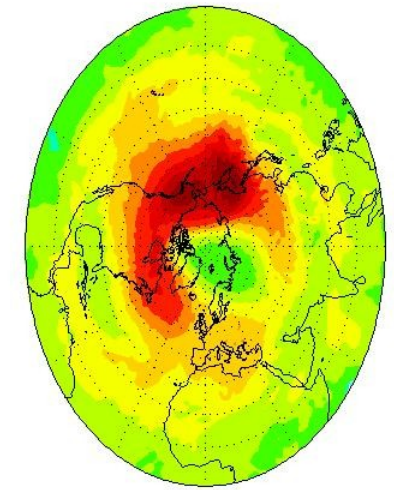
ASI 674 nm 21.5000 km 20130105



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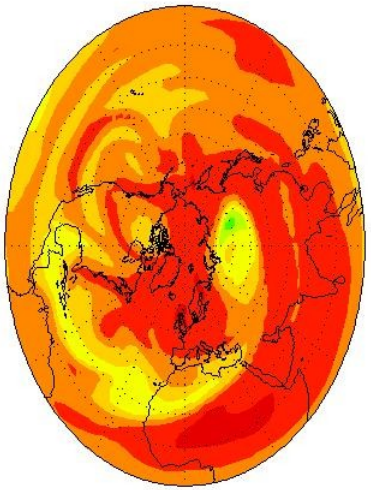
NCEP Team ilk 50 mb 20130105



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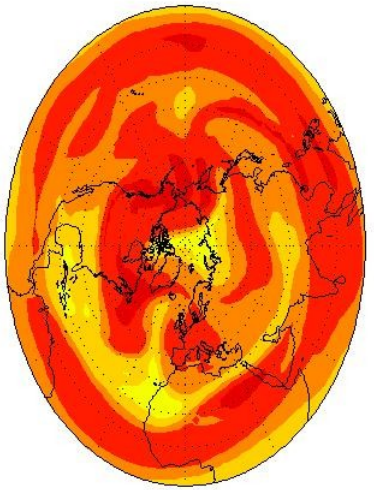
aerosol mixing ratio 550 nm 20 km 20130114



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aerosol mixing ratio 550 nm 20 km 20130105